Pebble Project Description

POA-2017-271

Updated June 2020

Pebble Limited Partnership
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TABLES

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ACRONYMS AND ABBREVIATIONS

ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ADNR	Alaska Department of Natural Resources
ADOT&PF	Alaska Department of Transportation and Public Facilities
ADSP	Alaska Dam Safety Program
ANCSA	Alaska Native Claims Settlement Act
ANFO	ammonium nitrate and fuel oil
BMPs	best management practices
CFR	Code of Federal Regulations
cy	cubic yards
EPA	U.S. Environmental Protection Agency
°F	degrees Fahrenheit
H:V	horizontal:vertical (horizontal to vertical)
IDF	Inflow Design Flood
ISO	International Organization for Standardization
ML	Metal Leaching
MMPA	Marine Mammal Protection Act
MW	megawatts
NEPA	National Environmental Policy Act
NFK	North Fork Koktuli River
NPAG	Non-Potentially Acid Generating
OCS	Outer Continental Shelf
PAG	Potentially Acid Generating
PHABSIM	Physical Habitat Simulation System
PMF	Probable Maximum Flood
PMP	Probably Maximum Precipitation
ROW	right-of-way
SAG	semi-autogenous grinding
SFK	South Fork Koktuli River
TSF	Tailings Storage Facility
TSS	Total suspended solids
USGS	U.S. Geological Survey
UTC	Upper Talarik Creek
WMP	Water Management Pond
WTP	Water Treatment Plant

1. PROJECT OVERVIEW

Pebble Limited Partnership (PLP) is proposing to develop the Pebble copper-gold-molybdenum porphyry deposit (Pebble Deposit) as an open-pit mine, with associated infrastructure, in southwest Alaska. This project description summarizes information about the environmental setting, engineered facilities and operations for the proposed Pebble Project (Project) from initial construction through closure and reclamation. It is intended to support the National Environmental Policy Act (NEPA) review process and other permitting efforts for the Project.

1.1. PEBBLE PROJECT SUMMARY INFORMATION[1]

- Project operating life of 20 years.
- A total of 1.44 billion tons of material mined over the life of the Project.
- Final pit dimensions of 6,800 feet in length, 5,600 feet in width, and 1,950 feet in depth.
- Mining rate up to 73 million tons per year, average rate of 70 million tons per year.
- Milling rate up to 66 million tons per year.
- Average annual copper-gold concentrate production (dry concentrate) of 613,000 tons.
- Average annual molybdenum concentration production (dry concentrate) of 15,000 tons.
- Final bulk tailings storage facility (TSF) capacity of 1,140 million tons.
- Temporary storage of 155 million tons of pyritic tails in the pyritic TSF.
- Temporary storage of up to 93 million tons of Potentially Acid Generating (PAG) and/or Metal Leaching (ML) waste rock in the pyritic TSF until closure.
- Power plant generating capacity of 270 megawatts (MW).
- Project operating schedule of two 12-hour shifts per day for 365 days per year.
- An 82-mile transportation corridor from the mine site to a year-round port site located north of Diamond Point in Iliamna Bay on Cook Inlet consisting of:
  - A private two-lane unpaved road that connects to the existing Iliamna/Newhalen road system.
  - A buried concentrate pipeline to transport copper-gold concentrate from the mine site to the port and a return water pipeline to the mine site.
- Bulk lightering of concentrate between the Diamond Point Port and an offshore lightering location in Iniskin Bay for loading onto bulk carriers.
- A port facility and jetty with docking for lightering and supply barges.

[1] Design criteria as presented are approximate and have been averaged and rounded as appropriate for ease of reference.

    - Annual vessel traffic of up to 27 concentrate vessels and 33 supply barges.

- A 164-mile gas pipeline from the Kenai Peninsula across Cook Inlet to the Project site with a compressor station on the Kenai Peninsula.
- Employment of 850 to 2,000 personnel for operations and construction, respectively.

1.2. BACKGROUND

The Project is located on land acquired by the State of Alaska in 1974 via a three-way land swap with the federal government and Cook Inlet Region, Inc. The land was selected by the state specifically for its mineral development potential. The initial discovery of the Pebble Deposit was made in 1988 by Cominco Alaska, a division of Cominco Ltd. (Cominco). Cominco (later acquired by Teck Resources Limited) discontinued work on the project in 1997, and in 2001 the Pebble claims were optioned by a subsidiary of Northern Dynasty Minerals Ltd. (Northern Dynasty).

Northern Dynasty began exploring the property, with significant success, expanding the Pebble Deposit from one billion to four billion tons by the end of 2004. An extensive environmental baseline data collection program commenced in that year, as well as geotechnical investigation and preliminary engineering studies. In 2005, Northern Dynasty exercised its option to acquire the Project and in the same year discovered a significant, higher grade eastern extension to the deposit. Over the next seven years, the Pebble Deposit was expanded through drilling.

In 2007, Northern Dynasty formed PLP with another company and placed the Project into the partnership. Over the next six years, PLP continued to advance the Project through additional drilling, environmental data collection, and engineering studies. In 2013, the other company left PLP and it reverted to a wholly owned subsidiary of Northern Dynasty.

To date, more than one million feet of drilling has been conducted on the Pebble Deposit.

Products from mining this deposit can supply important mineral resources for alternative energy and other purposes of strategic national significance. The Pebble Deposit has significant regional economic importance for southwest Alaska and the entire state through the creation of high-wage jobs and training opportunities, supply and service contracts for local businesses, and government revenue.

1.3. PROJECT DESIGN CONSIDERATIONS

Plans for the design and operation of the Project have focused on the avoidance and minimization of environmental impacts to waterbodies, wetlands, wildlife and aquatic habitat, areas of cultural significance, and areas of known subsistence use and addressing stakeholder concerns. In addition to meeting or exceeding local, state, and federal regulatory requirements, the Project incorporates the following concepts into the design:

- The Project plan is to mine the near-surface portion of the Pebble Deposit. This has significantly reduced the footprint of the open pit, TSF, and mine facilities, as well as eliminated the need for a permanent waste rock storage facility.

- The layout is designed to consolidate the majority of site infrastructure in a single drainage – the North Fork Koktuli River (NFK) – and avoid placing waste rock or tailings in the Upper Talarik Creek (UTC) drainage.
- The Diamond Point Port design includes a caisson-supported dock facility rather than an earth-filled causeway or pile-supported dock. The caisson design significantly reduces the Waters of the US footprint compared to an earth-filled design, and effectively eliminates in-water impact noise generated by pile driving that might adversely affect sensitive marine species.
- A natural gas pipeline and gas-fired electrical generation are being used to power the Project, thereby eliminating the need to transport and store large amounts of diesel fuel for power generation.
- To address stakeholder concerns regarding the transportation and use of cyanide, there is no secondary recovery of gold from the pyritic tailings using a cyanide leach.

The Project adopts a design-for-closure philosophy that considers closure and post-closure site management requirements during all operating phases. Examples include:

- Segregated storage facilities for bulk and pyritic tailings. Bulk tailings will remain in place at closure.
- A lined pyritic TSF. PAG and ML waste rock will be stored with pyritic tailings in the lined pyritic TSF during operations. At closure the stored waste rock will be backhauled to the pit and the pyritic tailings pumped to the pit for sub-aqueous storage in the pit lake. Storage of PAG/ML waste rock and pyritic tailings within the pit lake will avoid post-closure management of the pyritic TSF.

The Project has a comprehensive water management plan that utilizes strategic discharge of surplus treated water to downgradient streams to reduce the effect of stream flow fluctuations and minimize impacts to fish habitat.

1.4. Project Areas

The Project is located in a sparsely populated region of southwest Alaska near Iliamna Lake, within the Lake and Peninsula and Kenai Peninsula boroughs (Figure 1-1). The Project comprises four primary components: the mine site at the Pebble Deposit location, the port site at Diamond Point on Cook Inlet, the transportation corridor connecting these two sites, and a natural gas pipeline connecting to existing infrastructure on the Kenai Peninsula.

The transportation corridor consists of a road, concentrate pipeline, and return water pipeline from the mine site to the Diamond Point Port at the entrance to Iliamna Bay on Cook Inlet. The road will intersect the existing road network and connect the mine site to the villages of Iliamna and Newhalen (Figure 1-2). The gas pipeline will tie into existing gas supply infrastructure at Anchor Point on the Kenai Peninsula, cross Cook Inlet and come ashore at Ursus Cove, then

cross Ursus Head and Cottonwood Bay to the Diamond Point port. From the port the pipeline will parallel the access road to the mine site (Figure 1-1 and Figure 1-2).

The Bristol Bay watershed encompasses approximately 41,900 square miles and is defined by the Alaska Range to the east and southeast, the Kuskokwim Mountains to the west, and a range of hills to the north that separate it from the Kuskokwim River watershed. The largest rivers that drain into Bristol Bay are the Nushagak and Kvichak rivers, which together drain 49 percent of the Bristol Bay watershed, or approximately 20,000 square miles (Figure 1-3).

1.4.1. Mine Site

The Pebble Deposit is located under rolling, permafrost-free terrain in the Iliamna region of southwest Alaska, approximately 200 miles southwest of Anchorage and 60 miles west of Cook Inlet. The closest communities are the villages of Iliamna, Newhalen, and Nondalton, each approximately 17 miles from the Pebble Deposit (Figure 1-2).

The fully developed mine site will include the open pit, bulk TSF, pyritic TSF, overburden stockpiles, material sites, water management ponds (WMPs), milling and processing facilities, and supporting infrastructure such as the power plant, water treatment plants, camp facilities, and storage facilities (Figure 1-4).

The site is currently undeveloped and not served by any transportation or utility infrastructure.

1.4.2. Diamond Point Port and Lightering Locations

The port site (Figure 1-5) will be located north of Diamond Point in Iliamna Bay on the western shore of Cook Inlet, approximately 165 miles southwest of Anchorage and approximately 75 miles west of Homer.

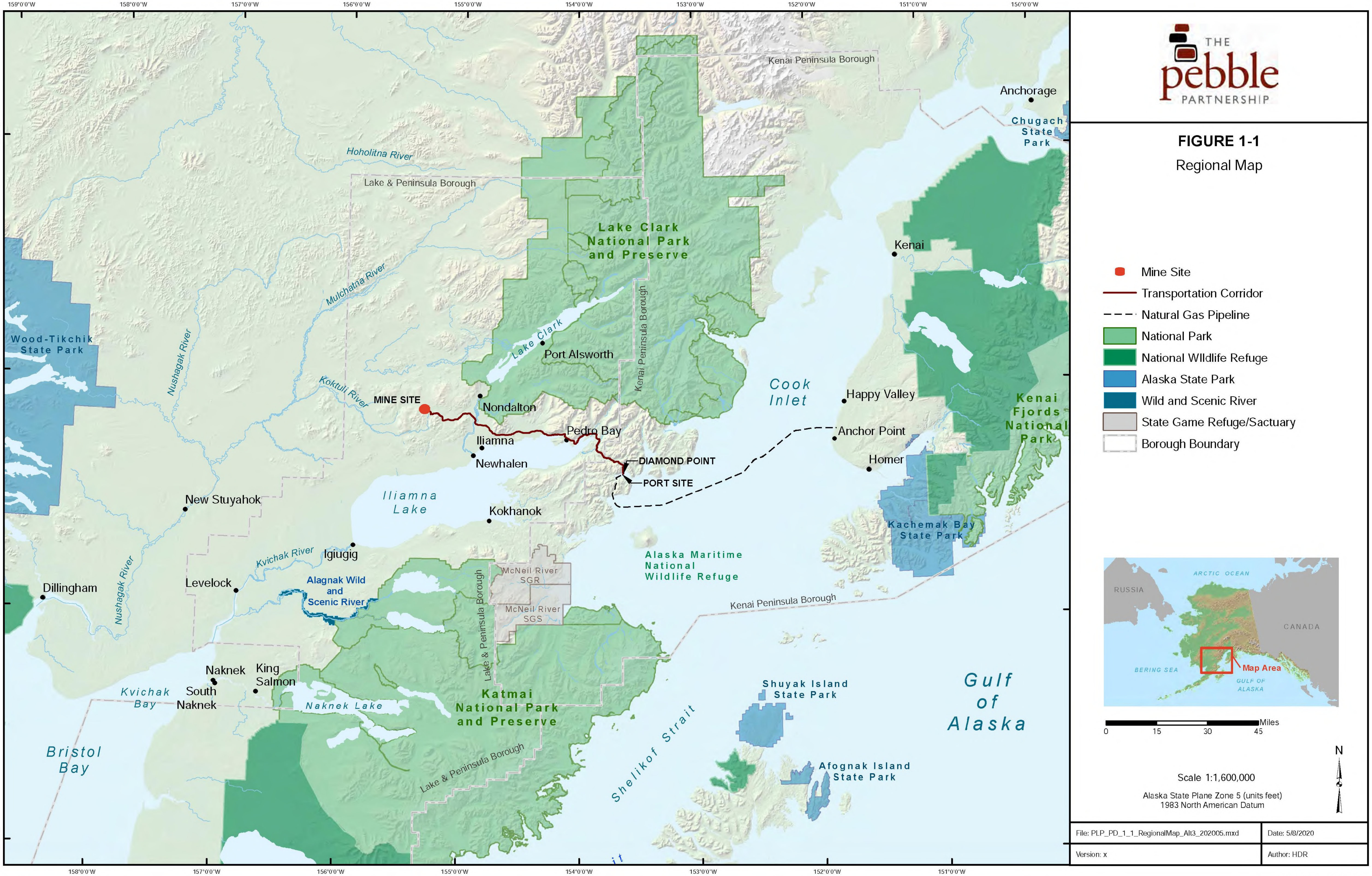
The port site will include shore-based and marine facilities for the shipment of concentrate, freight, and fuel for the Project. The shore-based facilities will include facilities for the dewatering of the concentrate and the receipt and storage of freight containers. Other facilities will include fuel storage and transfer facilities, power generation and distribution facilities, a pump station for the return water pipeline, maintenance facilities, employee accommodations, and offices.

The natural gas pipeline from the Kenai Peninsula will have an offtake to distribute natural gas to the port power generation facility.

The marine component includes a concrete caisson-supported access causeway, marine jetty, and barge loader with a 18-foot deep dredged access channel. Dredged material will be stored in on-shore stockpiles.

The port site area is not served by any surface transportation or utility infrastructure.

Copper-gold concentrate will be loaded onto lightering barges using an enclosed conveyor system at the Diamond Point Port and then transported to the lightering location in Iniskin Bay approximately 8 miles from the port (Figure 1-5) for transfer to bulk carriers.



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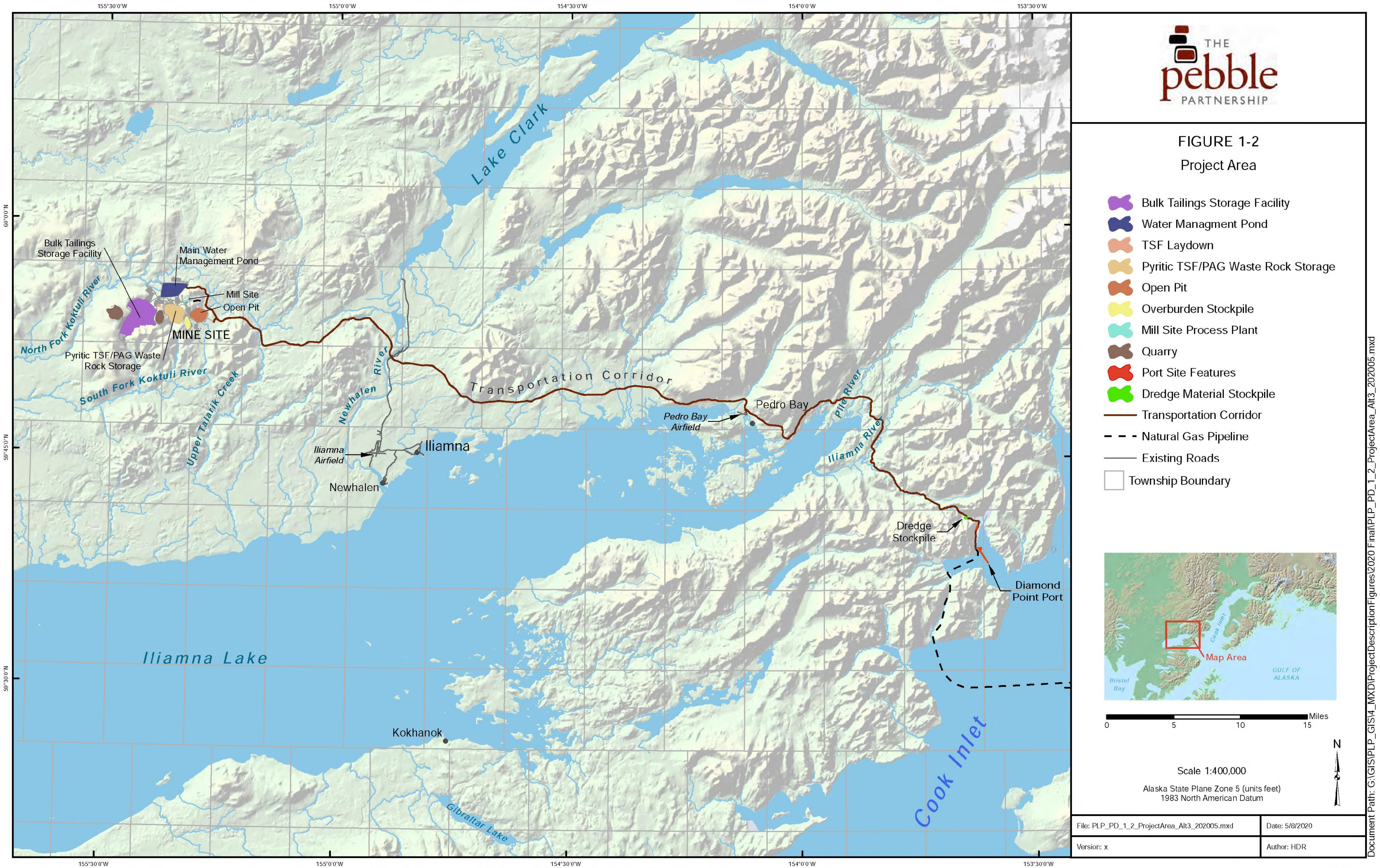

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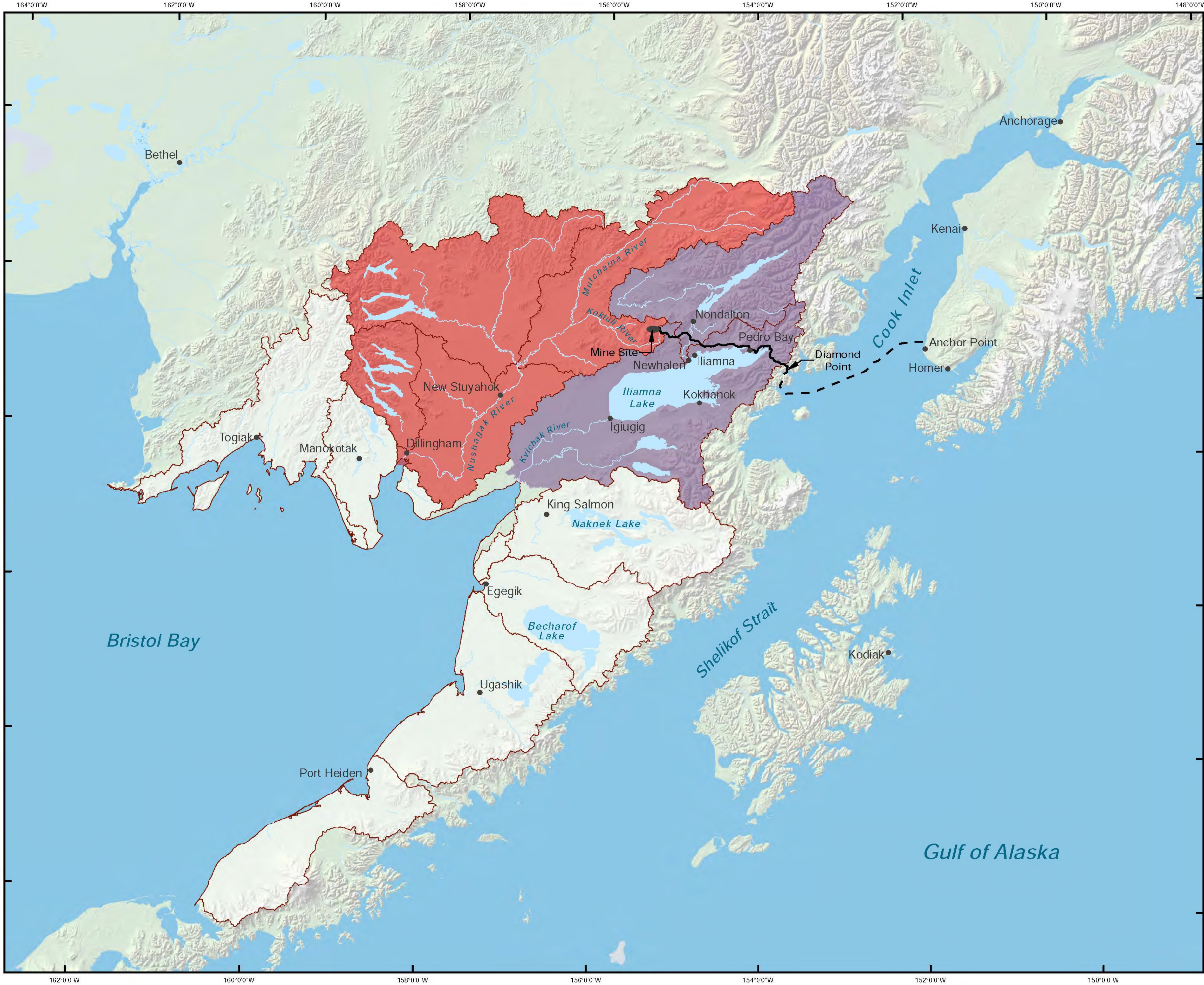

THE pebble PARTNERSHIP

FIGURE 1-3

Bristol Bay Watershed

Transportation Corridor
Natural Gas Pipeline
Nushagak Drainage
Kvichak Drainage
Subbasin (HUC8) Bristol Bay

Miles
0 25 50 75 100

N

Scale 1:2,750,000

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

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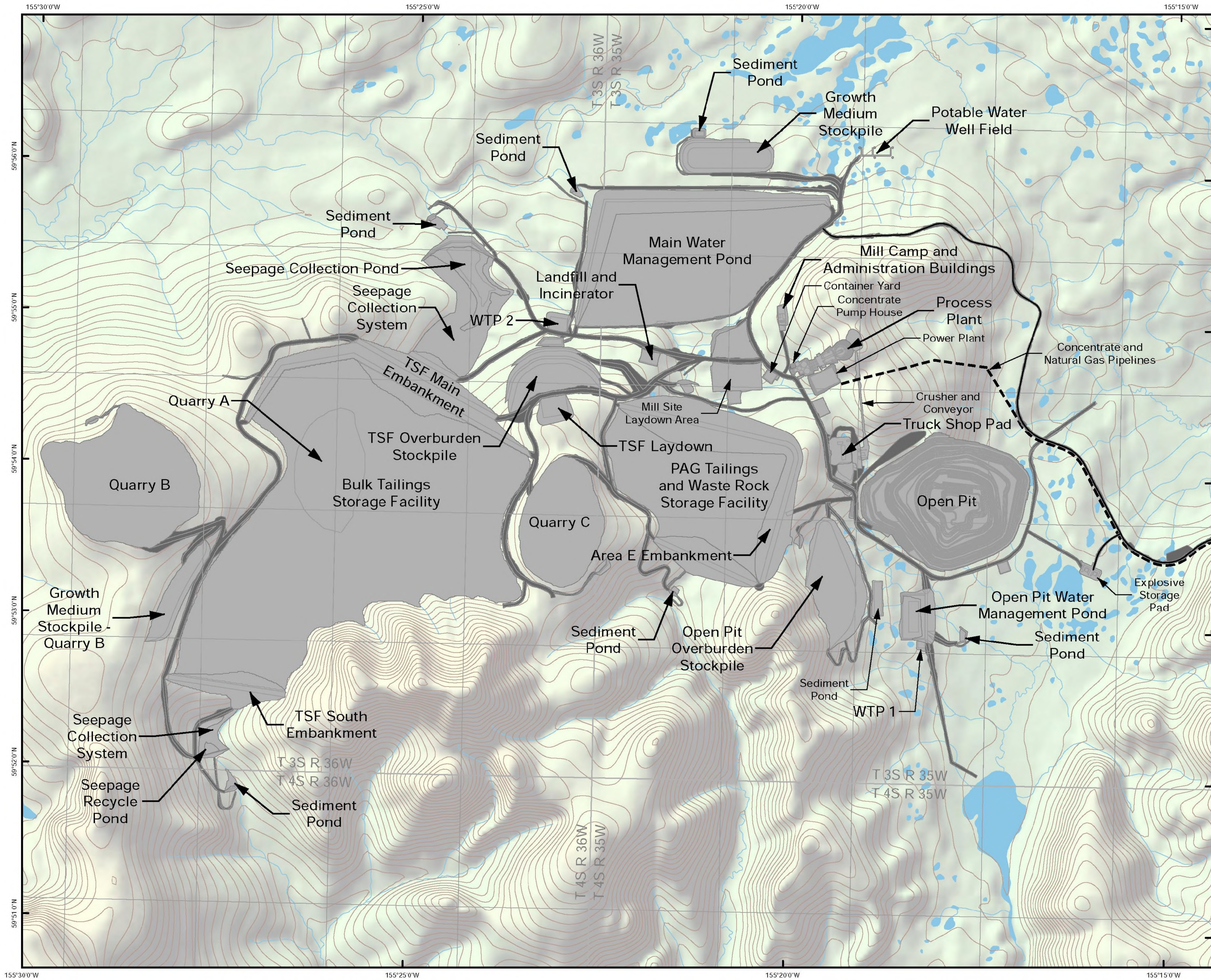
Version: x	Author: HDR

Document Path: G:\GIS\PLP_GIS\4_MXD\ProjectDescriptionFigures\2020 Final\PLP_PD_1_3_BristolBayWatershed_Alt3_202005.mxd



THE pebble PARTNERSHIP

FIGURE 1-4

Mine Site Map

Mine Site Footprint
Haul/Service/Access Road
Mine Site Access Road
Concentrate & Natural Gas Pipelines
50' Contour (Existing)
Township Boundary
Section Boundary

0 0.5 1 1.5 Miles

N

Scale 1:46,000

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

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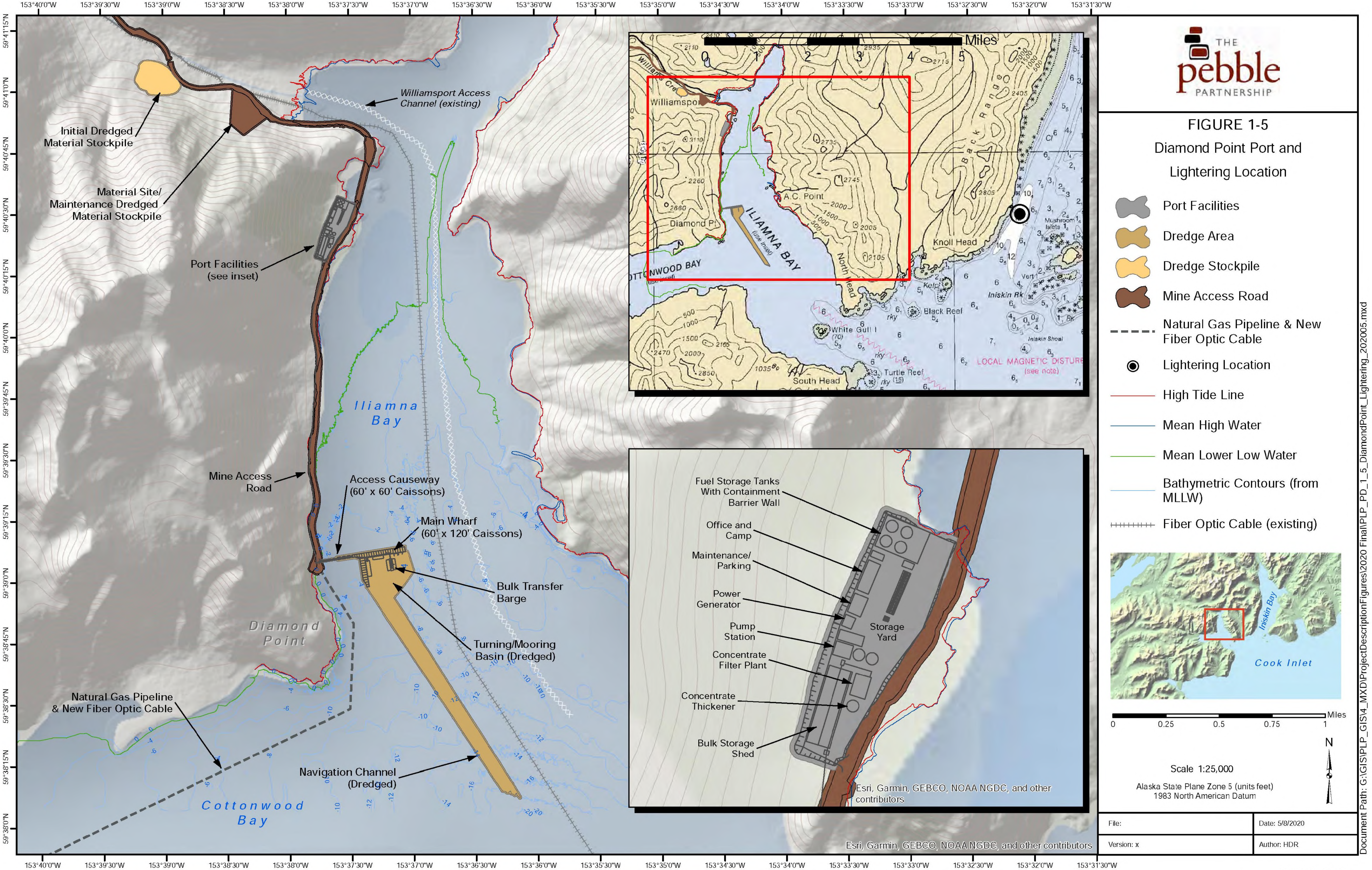

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1.4.3. Transportation Corridor

The transportation corridor, which will connect the mine site to the Diamond Point Port on Cook Inlet consists of a private, unpaved two-lane road heading 80 miles east from the mine site to the Diamond Point Port in Iliamna Bay with three pipelines buried in a corridor next the road. The State of Alaska operates an existing road between Williamsport on Iliamna Bay and Pile Bay on Iliamna Lake. The proposed road will parallel that existing road for approximately 4.5 miles from Williamsport and will then replace the existing road for approximately 6.5 miles from that point until the existing road turns toward Pile Bay. The proposed road to the mine also intersects the existing road network for the villages of Iliamna and Newhalen.

1.4.4. Natural Gas Pipeline Corridor

Natural gas, sourced through the existing natural gas supply infrastructure for the Cook Inlet area, will be the primary energy source for the Pebble Project. The gas pipeline alignment (Figure 1-1) will connect to existing infrastructure north of Anchor Point. Gas will be taken from the existing pipeline along the Sterling Highway and sent to a compressor station. From the compressor station, the pipeline heads southwest across Cook Inlet, before turning west to a landfall at Ursus Cove. The pipeline crosses Ursus Head and Cottonwood Bay before joining the transportation corridor at the Diamond Point Port.

1.5. LAND OWNERSHIP AND MINERAL RIGHTS

The Pebble Deposit is located on patented state land specifically designated for mineral exploration and development. Pebble Project facilities will straddle parts of five management units described in the Alaska Department of Natural Resources (ADNR) 2005 *Bristol Bay Area Plan* (amended 2013). These management units—known as R06-05, R06-23, R06-24, R06-30 and R10-02 are designated for minerals extraction. This designation allows for mineral exploration and development with oversight from ADNR. The management intent for all five units also stresses the need to protect the anadromous fish streams in the upper Koktuli River corridor and to minimize or avoid effects from mining on habitat and recreational activities near the upper reaches of UTC.

The Pebble Deposit lies within a 417-square-mile claim block held by subsidiaries of PLP. PLP does not currently own surface rights associated with these mineral claims. All lands within the claim block are owned by the State of Alaska. Surface rights may be acquired from the state government once areas required for mine development have been determined and permits awarded.

The transportation corridor crosses both state land and land patented under the Alaska Native Claims Settlement Act (ANCSA). Further detail is provided in Section 2.2.

1.6. CLIMATE

The climate in the area of the Pebble Deposit/mine site is transitional. Winters are characterized by a continental climate as frozen waterbodies and sea ice in Bristol Bay create a land-like mass, while summers have a maritime climate due to the influence of the open water of Iliamna Lake and, to a lesser extent, the Bering Sea, Bristol Bay, and Cook Inlet. Mean monthly temperatures range from about 55 degrees Fahrenheit (°F) in summer to 2°F in winter. Precipitation in the NFK drainage averages approximately 57.4 inches per year and in the South Fork Koktuli River (SFK) drainage averages approximately 50.8 inches per year. About one-third of this precipitation falls as snow. The wettest months are August through October. White-out conditions and windstorms or periods of poor light/visibility can be expected in winter.

Winter weather systems, consisting of cool to cold saturated air, typically travel into the region from the Bering Sea (west), along the Aleutian Island chain (southwest) and the Gulf of Alaska (south), resulting in frequent clouds, rain, and snow. Less frequent incursions of frigid, stable Arctic air masses produce shorter periods of clear, but very cold conditions. During summer, warm air masses from interior Alaska can cause atmospheric instability, which results in cumulus clouds and thunderstorm activity.

1.7. DEPOSIT GEOLOGY

The Pebble Deposit is hosted by Mesozoic, volcanically derived sedimentary rocks, called flysch, of the Kahiltna terrane, as well as a variety of intrusive igneous rocks emplaced into the flysch between approximately 99 and 90 million years ago during the mid-Cretaceous Period. Between 99 and 96 million years ago, early intrusions into the flysch comprised alkalic syenite to biotite

pyroxenite bodies, along with subalkalic diorite and granodiorite sills. Kaskanak Suite intrusions were emplaced approximately 90 million years ago and are the most important igneous event in the area. The suite comprises a granodiorite batholith that is exposed west of, but extends beneath, the Pebble Deposit, as well as several smaller intrusive granodiorite apophyses that emanate from the underlying batholith; collectively these Kaskanak intrusions drove the large magmatic-hydrothermal system that formed the Pebble Deposit.

The Pebble Deposit is classified as a porphyry copper deposit and is hosted by the intrusive and sedimentary rock types described above. Copper, gold, molybdenum, and other metals were transported by hot fluids that emanated from the magmas as they crystallized, and precipitated mostly as sulfide minerals in fractures, now preserved as veins, and as disseminations in the spaces between silicate minerals in the host rocks. The effects of the hot fluids are reflected by widespread hydrothermal alteration whereby some minerals originally present in host rocks were dissolved and replaced with suites of new minerals.

During the Late Cretaceous and Early Tertiary periods, the Pebble Deposit was uplifted by regional tectonic forces and eroded. The exposed deposit was rapidly covered by the Copper Lake Formation, a thick sequence of fine- to coarse-grained clastic sedimentary rocks and interbedded volcanic rocks. At a later point in the Tertiary Period, the eastern part of the Pebble Deposit was dropped up to 3,000 feet along normal faults into the East Graben, a structure that was progressively infilled by basalts, andesites, and subordinate clastic sediments as it grew. The Pebble Deposit and its host rocks were later tilted approximately 20 degrees to the east. The deposit was again uplifted in the later Tertiary Period, and its western part was scoured by Pleistocene glaciers that deposited a veneer of till, glacio-lacustrine, and outwash deposits that are mostly tens of feet thick or less, but which rarely are up to 300 feet thick in the vicinity of the Pebble Deposit. The present geometry of the Pebble Deposit comprises the West Zone, which is covered by thin glacial till and exposed in one small outcrop; the East Zone, which remains concealed by an eastward-thickening wedge of the Copper Lake Formation as well as overlying glacial till; and mineralization that extends an undetermined distance farther to the east but at great depth below the East Graben.

1.8. RESOURCE

The current combined measured and indicated resource estimate for the total Pebble Deposit is approximately 7.1 billion tons containing 57 billion pounds of copper, 70 million ounces of gold, 344 million ounces of silver, and 3.42 billion pounds of molybdenum. In addition, the inferred component of the total deposit is approximately 4.9 billion tons, with 24.5 billion pounds of copper, 36 million ounces of gold, 170 million ounces of silver, and 2.2 billion pounds of molybdenum. The Pebble Deposit also contains important quantities of palladium and rhenium.

The Project will mine approximately 1.3 billion tons of mineralized material (measured, indicated, and inferred) over the 20-year mine life containing 7.4 billion pounds of copper, 398 million pounds of molybdenum, and 12.1 million ounces of gold. The metal content of the reported total resource and the 20-year open pit is presented in Table 1-1.

Table 1-1. Pebble Deposit Estimated Resource (Measured, Indicated, and Inferred)

	Total Deposit		20-Year Open Pit	
	Weight	Grade	Weight	Grade
Copper	81.5 Blbs	0.34%	7.4 Blbs	0.29%
Molybdenum	5.64 Blbs	234 ppm	398 MMlbs	154 ppm
Gold	106.4 MMoz	0.30 g/t	12.1 MMoz	0.32 g/t

Blbs: billion pounds
MMoz: million ounces
MMlbs: million pounds
ppm: parts per million
g/t: grams per tonne

2. PROJECT SETTING

The environmental resources of the area surrounding the Pebble Deposit have been studied extensively by PLP. The *Pebble Project Environmental Baseline Document, 2004 through 2008*, which is available online at www.pebbleresearch.com, provides a complete report of environmental baseline studies conducted during those years. Pebble Project supplemental baseline data reports (2009-2013) provide data supplemental to the environmental baseline report and will accompany permit applications as appropriate.

2.1. MINE SITE

2.1.1. Physiography

The geographic location of the Pebble Deposit is described in Table 2-1.

Table 2-1. Pebble Deposit Geographic References

Item	Value
Pebble Deposit Centroid	59° 53' 51" N; 155° 18' 03" W
USGS Quadrangles	Iliamna D-6, D-7
Elevation:	
Minimum	775 ft amsl (SFK valley)
Maximum	2,760 ft amsl (Kaskanak Mountain)
Distance from:	
Cook Inlet	65 miles W
Iliamna Lake	16 miles N
Bristol Bay	100 miles W

amsl = above mean sea level
USGS = U.S. Geological Survey

The Pebble Deposit is located in the Nushagak-Big River Hills physiographic region. The area consists of low, rolling hills separated by wide, shallow valleys. Elevations range from approximately 775 feet in the SFK valley up to 2,760 feet on Kaskanak Mountain. Glacial and fluvial sediment of varying thickness covers most of the study area at elevations below approximately 1,400 feet, whereas the ridges and hills above 1,400 feet generally exhibit exposed bedrock or have thin veneers of surficial material. The hills tend to be moderately sloped with rounded tops. The valley bottoms are generally flat. No permafrost has been identified to date in the project area.

2.1.2. Ecology

The Pebble Deposit area is ecologically diverse, with rivers, tundra, marshy lowlands, and ponds. Much of the land is covered by alpine tundra, shrubs, wetland and scrub communities, or areas of mixed broadleaf and spruce trees, depending on elevation and location.

Rivers near the Pebble Deposit provide habitat for five species of anadromous Pacific salmon. Rainbow trout and other species of fish, such as Dolly Varden and Arctic grayling, are also present. The streams in this area contain many features that support fish spawning and rearing, including complex off-channel habitats, river gravel that promotes spawning, beaver ponds, and combinations of run/glides and riffles. A higher diversity of species and abundance of fish, as well as the most spawning and rearing activity, is found in the lower and middle reaches of these streams, not in the headwater reaches at the Pebble Deposit site.

Various raptors and more than 40 species of water birds are found in the mine area and 22 species have been confirmed as breeding there. The many species of mammals that inhabit this region, while ecologically and economically important, are not particularly abundant. There are moderate densities of brown bear and low densities of black bear, moose, coyotes, wolves, river otters, and wolverines. The mine site is within the historical range of the Mulchatna caribou herd, but radio telemetry and aerial transect surveys suggest that high-density use of the area occurs only during the summer post-calving season when caribou move through the western edge of the project area. No habitat in the mine area has been classified as high value for caribou.

2.1.3. Hydrology

The Pebble Deposit straddles the upper reaches of the SFK and UTC drainages (Figure 2-1). The headwaters of the NFK are immediately north of the Pebble Deposit. The SFK drains south from the Pebble Deposit area, and then west and northwest, where it joins the NFK, which flows west from the Pebble Deposit area. At the confluence, these streams form the Koktuli River, which flows into the Mulchatna River, a tributary to the Nushagak River. The Nushagak River flows into Bristol Bay near the city of Dillingham. Upper Talarik Creek flows south from the Pebble Deposit area and then southwest into Iliamna Lake, which is the source of the Kvichak River.

2.1.3.1 Koktuli River

The NFK and SFK are two of 24 tributaries of similar or larger size in the 315-mile-long Nushagak River system. The north and south forks of the Koktuli River flow for 36 and 40 miles, respectively, to the main stem Koktuli River. The Koktuli River flows for approximately 39 miles before entering the Mulchatna River, which flows another 44 miles before entering the Nushagak River. The Nushagak River flows about 110 miles before it empties into Bristol Bay southwest of Dillingham (Figure 1-1). The total distances from the NFK and SFK headwaters to Bristol Bay are 228 miles and 232 miles, respectively.

2.1.3.2 Kvichak River

The UTC drainage is in the 225-mile-long Kvichak River system. The headwaters of the Kvichak River system are approximately 109 miles northeast of the Pebble Deposit at the source of the Tlikakila River at Lake Clark Pass. UTC flows approximately 39 miles to Iliamna Lake (Figure 2-1). The lake empties into the Kvichak River, which flows approximately 70 miles to Bristol Bay. The total distance from the headwaters of UTC, across the lake, and to Bristol Bay is approximately 140 miles.

2.2. Transportation Corridor

The transportation corridor connects the Diamond Point Port to the mine site via a private, two-lane access road. The road will parallel and replace portions of the existing Williamsport–Pile Bay road and intersect the existing Iliamna/Newhalen road system. The natural gas, concentrate, and return water pipelines will parallel the transportation corridor between the port and mine site. Approximately 30 percent of the corridor land is owned by the State of Alaska, with the remaining 70 percent divided among various ANCSA corporations, as shown in Table 22 and Figure 2-2.

The transportation corridor also crosses two Native Allotments (one in the vicinity of Knutson Bay and one in Iliamna Bay) and one private parcel.

Table 2-2. Transportation Corridor Land Ownership[a]

Land Ownership	Road Segments (Miles)	Percentage
State of Alaska	24	30
Pedro Bay Corporation	33	40
Iliamna Natives Limited	15	18
Tyonek Native Association	5	6
Seldovia Native Association	3	4
Salamatof Native Association Inc.	<1	<1
Native Allotment # AKAA 051014	<1	<1
Native Allotment # AKAA 007150A	<1	<1
Total Corridor Miles	82	100

[a] Distances presented are approximate and have been rounded for ease of reference.

2.2.1. Physiography

The geographic location of the transportation corridor is described in Table 2-3.

Table 2-3. Transportation Corridor Geographic References

Item	Value
USGS Quadrangles	Iliamna C-2, C-3 Iliamna D-3, D-4, D-5, D-6, D-7
Elevation:	
Minimum	Near sea level (Diamond Point Port)
Maximum	1,700 ft (leaving mine site)

The transportation corridor is located within three physiographic divisions: Nushagak-Big River Hills, Nushagak-Bristol Bay Lowlands, and the Alaska Range. The terrain includes a range of types, from flat to moderately undulating near the Pebble Deposit, gently sloping and colluvial terrain along the north shore of Iliamna Lake, and mountainside slopes to narrow valley bottoms through the Alaska Range to Iliamna Bay. No permafrost has been identified in the transportation corridor.

2.2.2. Ecology

The transportation corridor traverses a variety of terrain types. From the mine site eastward along the north shore of Iliamna Lake to Canyon Creek the terrain is generally flat to moderately undulating or gently sloping. This area is composed primarily of dense, low shrub understory and sparse tree cover. Moving eastward to Chinkelyes Creek the terrain is more mountainous and forested. The floodplains along the Pile and Iliamna rivers are complex mosaics of vegetation, dominated by willows in flood channels, bars, and abandoned channels. Crossing the divide between the Bristol Bay and Cook Inlet watersheds, the terrain remains mountainous with more shrubland vegetation. Finally, descending down to Cook Inlet along Iliamna Bay there is steep mountainous terrain with dense alder thickets that slope down to a rocky coast with salt-resistant herbaceous vegetation along the extensive mudflats and bedrock outcrops.

Rivers along the transportation corridor provide habitat for five species of anadromous Pacific salmon. Rainbow trout and other species of fish, such as Dolly Varden and Arctic grayling, are also present.

Forest and wetland habitats in the transportation corridor support types of wildlife similar to those at the mine site. Brown bear density is somewhat higher in the transportation corridor, with densities increasing as the corridor approaches the coast. Black bears occur in very low densities along the transportation corridor. Small numbers of caribou from the Mulchatna herd may be found foraging at higher elevations following calving within the transportation corridor north of Iliamna Lake. The transportation corridor contains migratory stopover and breeding habitats for many species of songbirds, raptors, and waterfowl.

2.2.3. Hydrology

The 80-mile-long access corridor crosses numerous streams within the Bristol Bay and Cook Inlet watersheds. The corridor originates in the Nushagak watershed at the mine site and traverses the Kvichak watershed along the north shore of Iliamna Lake. Both are within the greater Bristol Bay watershed. The corridor terminates at Diamond Point in the Tuxedni-Kamishak Bays watershed of the greater Cook Inlet watershed.

2.3. Diamond Point Port

The Diamond Point Port is located on three land parcels located on the west shore of Iliamna Bay.

Table 2-4. Diamond Point Port Land Ownership[a]

Land Ownership
Native Allotment # AKAA 051014
Seldovia Native Association
Tyonek Native Association

2.3.1. Physiography

The port site is located north of Diamond Point in Iliamna Bay. Diamond Point is a small cape marking the separation between Iliamna and Cottonwood bays. Topography is mountainous with steep slopes dropping to narrow rocky beaches and wide tidal mudflats. The port location is in the Iliamna C-2 USGS Quadrangle.

The Diamond Point port facility is located on three parcels of land—Native Allotment # AKAA 051014 and land belonging to Seldovia Native Association and Tyonek Native Association.

2.3.2. Ecology

The western shorelines from Kamishak Bay north to Iniskin Bay, including Iliamna and Cottonwood bays, are composed of diverse habitats, including steep rocky cliffs, cobble or pebble beaches, and extensive sand/mudflats. Eelgrass is found at a number of locations and habitats; eelgrass, along with macroalgae, is an important substrate for spawning Pacific herring. The port site is located within critical habitat for the Cook Inlet Beluga Whale and the Northern Sea Otter Southwest Distinct Population Segment (DPS). Cook Inlet Beluga Whale critical habitat includes nearshore waters out to two nautical miles. Northern Sea Otter critical habitat includes foraging areas and escape habitat from marine mammal predators.

2.3.3. Hydrology

The Cook Inlet basin is an expansive watershed surrounding the 180-mile-long Cook Inlet waterbody. Covering more than 38,000 square miles of southern Alaska, it receives water from six major watersheds and many smaller ones. More than ten percent of the basin is covered by glaciers

and suspended sediment loading in glacier fed rivers without lakes is significant, leading to a high suspended sediment load in portions of Cook Inlet.

Lower Cook Inlet is connected to the Pacific Ocean southwest through Shelikof Strait, and southeast by the Gulf of Alaska and demonstrates complex circulation on variable timescales. The region has the fourth largest tidal range in the world; tidal fluctuations in Iliamna Bay average 16 feet ranging as high as 23 feet. When the tide drops from mean high to mean low water, the inlet loses almost 10 percent of its volume, and exposes approximately 8 percent of its surface area. Most of these tidally exposed areas are in the arms at the north end of Cook Inlet and along the west side of the waterbody.

2.4. Natural Gas Pipeline Corridor

The natural gas pipeline connects the mine site and the port site to the Cook Inlet gas supply infrastructure. It ties to an existing pipeline near Anchor Point on the Kenai Peninsula, connecting to a compressor station, which is located on private land owned by the University of Alaska. The pipeline crosses state and federal Outer Continental Shelf (OCS) waters in Cook Inlet to Ursus Cove, crosses Ursus Head before crossing Cottonwood Bay to the port site north of Diamond Point. It parallels the transportation corridor to the mine site for most of its length before diverging from the road to cross directly to the power plant. (see Table 2-5).

Table 2-5. Natural Gas Pipeline Land Ownership[a]

Land Ownership	Road Segments (miles)	Percentage
Cook Inlet/Cottonwood Bay Crossing	Total miles: 78	
State of Alaska	16	10
Federal Waters – Alaska OCS	62	38
Ursus Head Crossing	Total miles: 6	
Salamatof Native Association Inc.	2	1
Seldovia Native Association	4	2
Transportation Corridor Parallels	Total miles: 79	
State of Alaska	21	13
Pedro Bay Corporation	33	20
Iliamna Natives Limited	15	9
Tyonek Native Association	5	3
Seldovia Native Association	3	2
Salamatof Native Association Inc.	<1	<1
Native Allotment # AKAA 051014	<1	<1
Native Allotment # AKAA 007150A	<1	<1
Mine Segment	Total miles: 2	
State of Alaska	2	1
Total Miles	**164**	**100**

[a] Distances presented are approximate and have been rounded for ease of reference. Totals may not sum.

2.4.1. Physiography

The geographic location of the natural gas pipeline corridor is defined in Table 2-6.

Table 2-6. Natural Gas Pipeline Geographic References

Item	Value[a]
USGS Quadrangles	Iliamna C-2, C-3 Iliamna D-3, D-4, D-5, D-6, D-7 Seldovia D-5
Elevation:	
Minimum	-230 ft
Maximum	1,700 ft

[a] All references in Table 2-3 apply to the natural gas pipeline, but are excluded from this table.

The pipeline is located in four physiographic regions—the Nushagak-Big River Hills, the Nushagak-Bristol Bay Lowlands, the Alaska Range, and the Cook Inlet-Susitna Lowlands. The terrain includes a range of types, from flat to moderately undulating near the Pebble Deposit/mine site, gently sloping and colluvial terrain along the north shore of Iliamna Lake, mountainside slopes to narrow valley bottoms through the Alaska Range. No permafrost has been identified in the pipeline corridor.

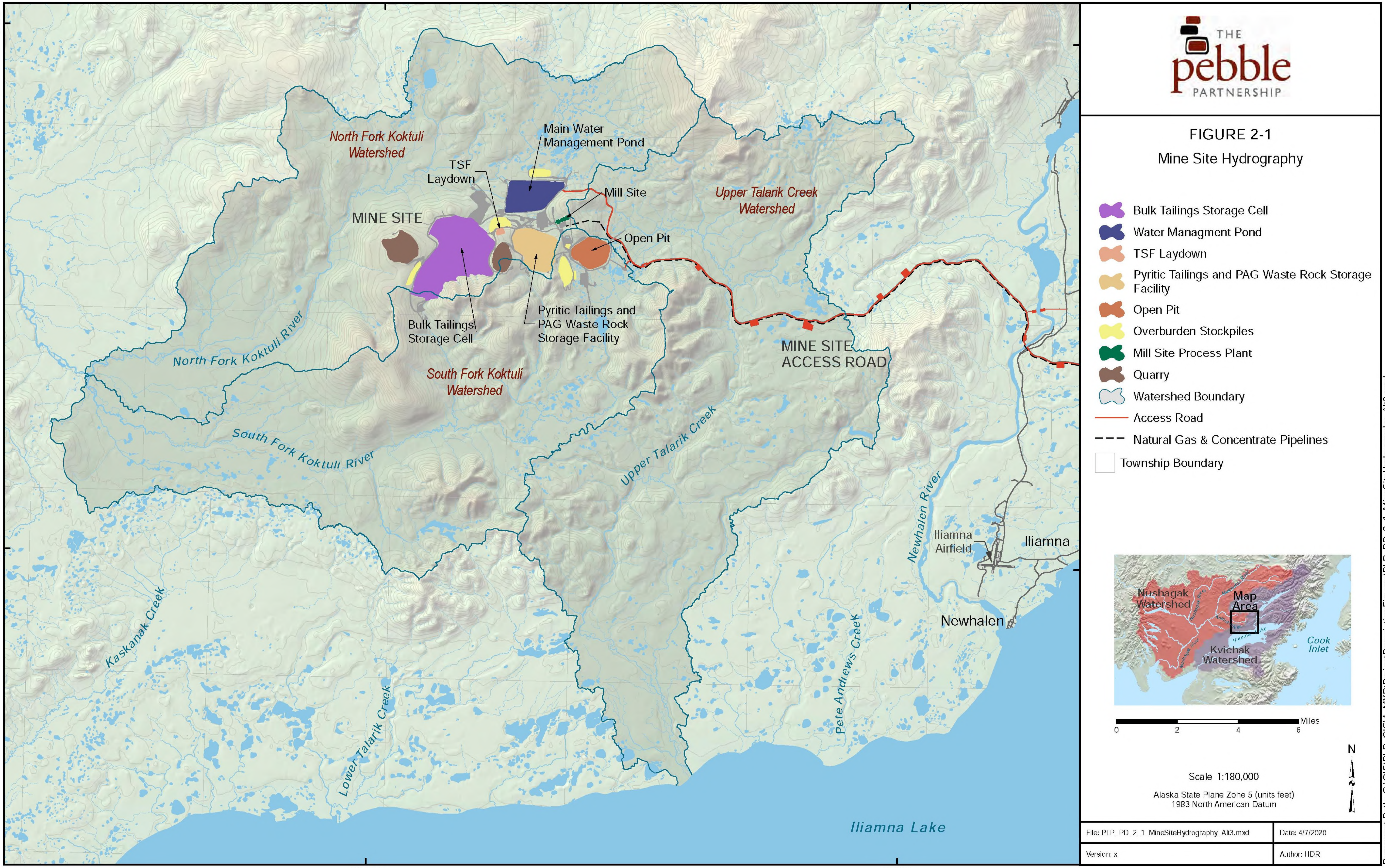
2.4.2. Ecology

The Cook Inlet region is composed of marine, coastal, and estuarine habitats. Pelagic waters within Cook Inlet are influenced by riverine and marine inputs resulting in salinity gradients and horizontal mixing throughout the inlet. Deeper waters of Cook Inlet are characterized by highly variable conditions, ranging from large boulders beds, to dune fields, and unconsolidated sediments on a smooth bottom. Strong tidal currents are present. The variety of habitats in the region support lower trophic organisms, fish, shellfish, marine mammals, and birds. Fish and shellfish are important components of the Cook Inlet food web, as they feed on lower trophic organisms such as plankton, and serve as prey for other fish, birds, and marine mammals.

The Cook Inlet region is a migratory corridor and juvenile rearing area for all five species of Pacific salmon, Dolly Varden, and steelhead trout, which spawn in rivers and streams throughout the region. Nineteen marine mammal species known to occur in Cook Inlet, including the Cook Inlet Beluga whale, which use nearshore waters for feeding in fall and winter. A large seabird nesting colony lies within Kamishak Bay on the western shore of lower Cook Inlet. As outlined in Section 2.3.2 coastal areas of western Cook Inlet, including Kamishak Bay, include critical habitat for the Cook Inlet beluga whale and the Cook Inlet northern sea otter.

2.4.3. Hydrology

See section 2.3.3 for a discussion of Cook Inlet hydrology.



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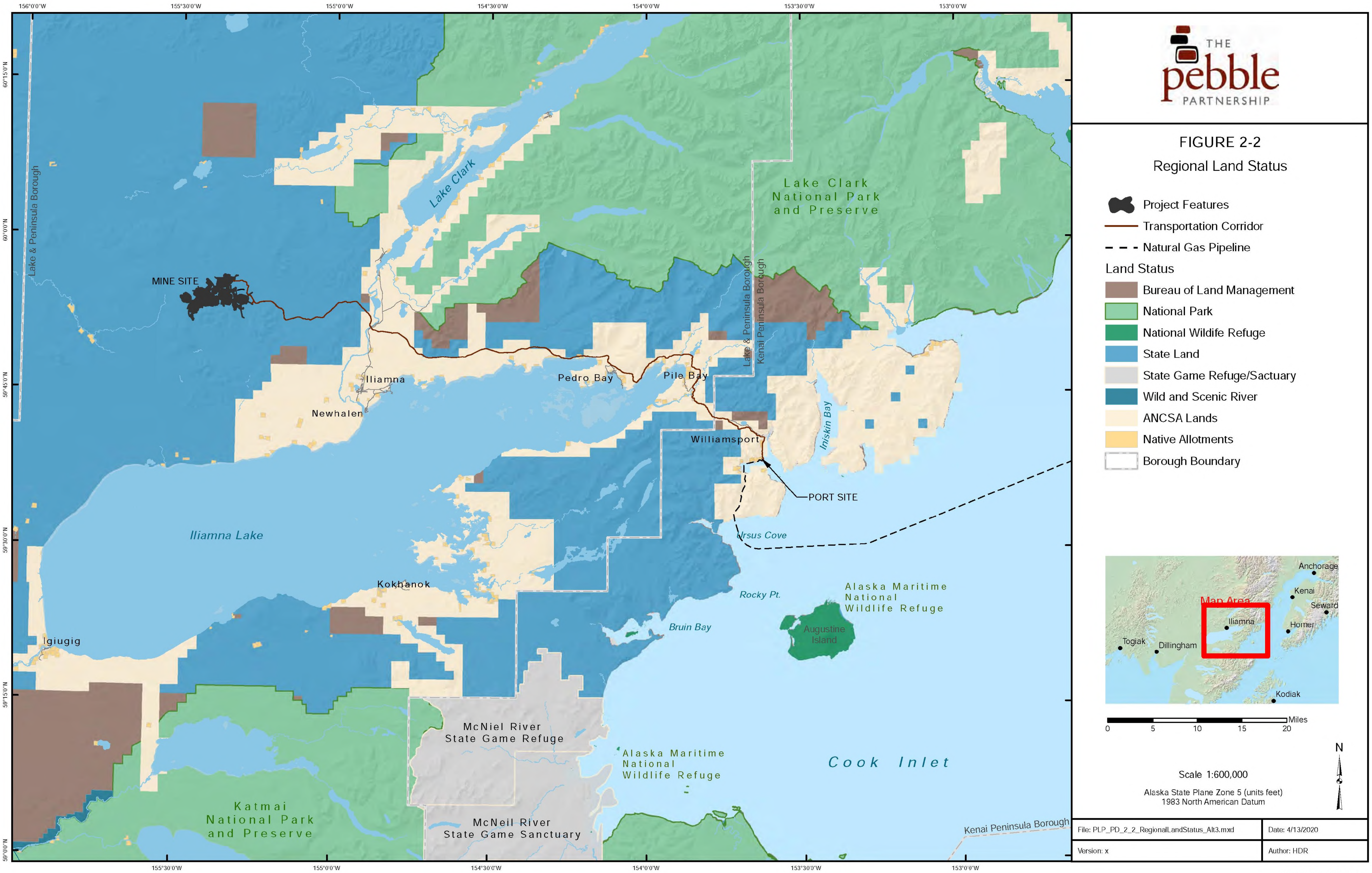

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2.5. State and Federal Interest Lands

Several state and federally managed lands lie within a 100-mile radius of the mine site or Diamond Point Port (Figure 2-2). Two large national park units—Katmai National Park and Preserve and Lake Clark National Park and Preserve—lie to the south and northeast of the mine site, respectively. Both parks straddle the Bristol Bay/Cook Inlet watershed divide, although most recreational use in both parks occurs in the Bristol Bay drainage, west of the divide. The Alagnak Wild and Scenic River flows west from Katmai National Park and Preserve and into the Kvichak River, which flows into Bristol Bay. The McNeil River State Game Refuge and Sanctuary, which lies north of Katmai National Park and Preserve, is in the Cook Inlet watershed. West of the mine site is Wood-Tikchik State Park, which is in the Bristol Bay watershed.

2.6. Local and Regional Communities

The Pebble Deposit is located in southwest Alaska's Lake and Peninsula Borough, home to an estimated 1,600 people in 18 local villages. Distances to various communities are shown in Figure 1-1. At more than 30,000 square miles, the Lake and Peninsula Borough is among the least densely populated boroughs or counties in the country. There are no roads into the borough, and few roads within it, contributing to an extremely high-cost of living and limited job and other economic opportunities for local residents.

The communities closest to the mine site are Nondalton, Iliamna, and Newhalen. Pedro Bay is also proximal to transportation infrastructure proposed for the Project. While PLP has generated employment for residents of villages throughout the Lake and Peninsula Borough and broader Bristol Bay region over the past decade, the communities surrounding Iliamna Lake have provided the greatest proportion of the local workforce.

With project infrastructure planned to connect the proposed mine site to the villages of Iliamna, Newhalen, and Pedro Bay, residents of these and other communities are expected to continue playing an important role in staffing the Project in the future.

The Bristol Bay Borough is the only other organized borough in the Bristol Bay region, with some 900 full-time residents in three villages. A significant portion of the Bristol Bay region is not contained within an organized borough; the Dillingham Census Area comprises 11 different communities. A total of about 7,500 people call the Bristol Bay region home, with the largest population centers in Dillingham, King Salmon, and Naknek.

Most Bristol Bay villages have fewer than 150–200 full-time residents. A majority of the population is of Alaska Native descent and Yup'ik or Dena'ina heritage. Virtually all of the region's residents participate to some degree in subsistence fishing, hunting, and gathering activities. Subsistence is central to Alaska Native culture and provides an important food source for local residents.

There are 13 incorporated first- and second-class cities in the Bristol Bay region and 31 tribal entities recognized by the U.S. Bureau of Indian Affairs. There are also 24 Alaska Native Village Corporations created under the ANCSA, five of which – Iliamna Natives Limited, Pedro Bay Corporation, Seldovia Native Association, Salamatof Native Association Inc. , and Tyonek Native

Association – hold surface rights for significant areas of land near the Pebble Deposit and along the proposed transportation infrastructure corridor.

The commercial fishing, guiding, and tourism-related sectors provide many jobs in the region, but the work is highly seasonal; year-round employment is the exception rather than the norm. A lack of employment and economic opportunity has contributed to a declining population in many Lake and Peninsula Borough and regional villages, resulting in the closure of several schools over the past decade.

2.7. Legal Description

The legal description of lands on which major project elements will be located is shown in Table 2-6. Sections are within the Seward Meridian Survey of the Public Land Survey System.

Table 2-7. Project Location (Public Land Survey System)

Range	Township	Section
15 West	4 South	14
26 West	4 South	31
	5 South	29, 30, 32, 33, 34, 35
	6 South	1, 2, 12, 13, 24, 27, 34
	7 South	3, 9, 10, 16, 21
27 West	4 South	20, 21, 22, 23, 24, 25, 28, 29, 30, 31, 36
	5 South	2, 3, 10, 14, 15, 23, 24, 25
28 West	4 South	19, 20, 28, 29, 33, 34, 35, 36
	5 South	3, 4
29 West	4 South	17, 18, 19, 20, 21, 22, 23, 24, 27, 28
30 West	4 South	13, 14, 15, 18, 19, 20, 21, 22, 23
31 West	4 South	13, 19, 20, 21, 22, 23, 24, 27, 28, 29, 30
32 West	3 South	31
	4 South	7, 8, 9, 10, 15, 16, 22, 23, 24, 25
33 West	3 South	20, 21, 22, 26, 27, 28, 29, 30, 31, 35, 36
	4 South	1, 12
34 West	3 South	29, 30, 32, 33, 34, 35, 36
	4 South	2, 3, 4, 5
35 West	3 South	7, 8, 9, 10, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 32, 33
	4 South	4
36 West	3 South	11, 12, 13, 14, 15, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 33, 34
	4 South	3

3. PROJECT COMPONENTS AND OPERATIONS

This section describes the various project components and the operations associated with those components through the active life of the Project. Construction will last for approximately four years, followed by a commissioning period and 20 years of mineral processing. Mining preproduction will start during construction with removal of overburden and waste rock material and active mining from the pit will continue through the 20-year operations period. Figure 1-4 shows the layout of the mine site, including the major facilities and site infrastructure.

3.1. Summary Project Information

A summary of mining and process related information is shown in Table 3-1.

Table 3-1. Summary Project Information[a]

Item	Value
General Operation	
Construction	4 years
Total project operations	20 years
Daily schedule	24 hours
Annual schedule	365 days
Mine Operation	
Preproduction mined tonnage	33 million tons
Average annual mining rate	70 million tons
Operations mined tonnage	1,410 million tons
Mine life strip ratio	0.12:1 (waste: mineralized material)
Open pit dimensions	6,800 x 5,600 ft, 1,950 ft deep
Process Operation	
Daily process rate	180,000 tons
Annual process volume	66 million tons
Copper-gold concentrate	613,000 tons per year (average)
Molybdenum concentrate	15,000 tons per year (average)
Pyritic Tailings Storage Facility	
Approximate capacity (tailings)	155 million tons
Approximate capacity (PAG waste)	93 million tons
South embankment (height)	215 feet
North embankment (height)	335 feet
East embankment	225 feet

Item	Value
Bulk Tailings Storage Facility	
Approximate capacity	1,140 million tons
Main embankment (height)	545 feet
South embankment (height)	300 feet
Main Water Management Pond	
Approximate capacity	2,450 million cubic feet (56,000 ac-ft)
Embankment height	190 feet
Concentrate Pipeline	
Diameter	6.25 inches

[a] Design criteria as presented are approximate and have been averaged and rounded as appropriate for ease of reference.

3.2. Mining

3.2.1. Methods and Phasing

The Pebble Mine will be a conventional drill, blast, truck, and shovel operation with an average mining rate of 70 million tons per year and an overall stripping ratio of 0.12 ton of waste per ton of mineralized material.

The open pit will be developed in stages, with each stage expanding the area and deepening the previous stage. The final dimensions of the open pit will be approximately 6,800 feet long and 5,600 feet wide, with depths to 1,950 feet.

Mining will occur in two phases – Preproduction and Production.

The mine operation will commence during the last year of the Preproduction Phase and extend for 20 years during the Production Phase. Approximately 1,300 million tons of mineralized rock and 150 million tons of waste rock and overburden will be mined. Non-potentially acid generating (NPAG) and non-ML waste will be used in construction of the tailings embankments. The PAG and ML waste rock will be stored in the pyritic TSF until closure, when it will be back-hauled into the open pit. Fine- and coarse-grained soils will be stored southwest of the pit and north of the TSF embankments and will be used for reclamation during mine closure.

The Preproduction Phase consists of dewatering the pit area and mining of non-economic materials overlying the mineralized material from the initial stage of the open pit. Dewatering will begin approximately one year before the start of Preproduction mining. Approximately 33 million tons of material will be mined during this phase (Table 3-2).

Table 3-2. Mined Material—Preproduction Phase

Material Type	Quantity
Overburden	22 million tons
Waste rock	11 million tons

The Production Phase encompasses the period during which economic-grade mineralized material will be fed to the metallurgical process plant that produces concentrates for shipment and sale. The Production Phase is planned to last for 20 years. Mineralized material will be mined and be fed through the process plant at a rate of 180,000 tons/day. The open pit will be mined in a sequence of increasingly larger and deeper stages. Approximately 1.4 billion tons of material are planned to be mined during the Production Phase (Table 3-3).

Table 3-3. Mined Material—Production Phase

Material Type	Quantity
Overburden	38 million tons
Mineralized material process plant feed	1,291 million tons
Waste rock	82 million tons

3.2.2. Blasting

Most open pit blasting will be conducted using emulsion blasting agents manufactured on site. In dry conditions, a blend of ammonium nitrate and fuel oil (ANFO) can be used as the blasting agent. However, most ammonium nitrate will be converted to an emulsion blasting agent because of its higher density and superior water resistance. Initial operations during the Preproduction Phase may use pre-packed emulsion blasting agents or a mobile bulk emulsion manufacturing plant. After the explosives plant is completed, the emulsion-based ANFO explosive will be used as the primary blasting agent.

The ANFO will be stored separately as a safety precaution. All explosive magazines will be constructed and operated to meet mine safety and health regulations. The ammonium nitrate solution will be mixed with diesel fuel and emulsifying agents in a mobile mixing unit on the mining bench where blasting is to take place. The emulsion will become a blasting agent only once it is sensitized using the sensitizing agent while in the drill hole.

Based on knowledge of the rock types in the Pebble Deposit, blasting will require an average powder factor of approximately 0.5 pounds per ton of rock. Blasting events during the Preproduction Phase will occur approximately once per day. The frequency will increase during the Production Phase, with events occurring as often as twice per day.

3.2.3. Waste Rock and Overburden Storage

Waste rock is mined material with a mineral content below an economically recoverable level that is removed from the open pit, exposing the higher-grade production material. Waste rock will be segregated by its potential to generate acid. NPAG and non-ML waste rock may be used for embankment construction. PAG and ML waste rock will be stored in the pyritic TSF until mine closure, when it will be back-hauled into the open pit. Quantities of material mined are outlined in Table 3-1 and Table 3-2.

During the Preproduction Phase, approximately 33 million tons of non-mineralized and mineralized material will be removed from the open pit. Non-mineralized waste and overburden will be stockpiled or used in construction, mineralized waste will be stockpiled and relocated to the pyritic TSF once complete, or if grades are sufficient, stockpiled for milling once the mill is complete. Material will be stockpiled within the pit footprint, or in designated stockpiles as appropriate.

Overburden is the unconsolidated material lying at the surface. At the Pebble Deposit, the overburden depth ranges from 0 to 140 feet. Overburden removal will commence during the Preproduction Phase and will recur periodically during the Production Phase at the start of each pit stage. The overburden will be segregated and stockpiled in a dedicated location southwest of the open pit. A berm built of non-mineralized rock will surround the overburden to contain the material and increase stability. Overburden materials deemed suitable will be used for construction. Fine- and coarse-grained soils suitable for plant growth will be stockpiled for later use as growth medium during reclamation. Growth medium stockpiles will be stored at various locations around the mine site and stabilized to minimize erosion potential.

3.2.4. Equipment

The Project will use the most efficient mining equipment available in the production fleet to minimize fuel consumption per ton of rock moved. Most mining equipment will be diesel-powered. This production fleet will be supported by a fleet of smaller equipment for overburden removal and other specific tasks for which the larger units are not well-suited. Equipment requirements will increase over the life of the mine to reflect increased production volumes and longer cycle times for haul trucks as the pit is lowered (Table 3-4). All fleet equipment will be routinely maintained to ensure optimal performance and minimize the potential for spills and failures. Mobile equipment (haul trucks and wheel loaders) will be serviced in the truck shop; track-bound equipment (shovels, excavators, drills, and dozers) will be serviced in the field under appropriate spill prevention protocols.

Table 3-4. Production Phase Equipment

Equipment Unit	Class	Year 1 Quantity	Average Quantity	Peak Quantity
Electric shovel	73 cy	1	2	2
Diesel hydraulic shovel	53 cy	1	1	1
Wheel loader	53 cy	1	1	1
Electric drill	12.25 in	1	2	2
Diesel drill	12.25 in	1	1	1
Diesel drill	6.5 in	1	1	1
Diesel haul truck	400 ton	7	11	17
Diesel haul truck	150 ton	5	5	5

cy = cubic yards

Track-mounted electric shovels will be the primary equipment unit used to load blasted rock into haul trucks. Each electric shovel is capable of mining at a sustained rate of approximately 30 million tons per year. Diesel hydraulic shovels, due to their greater flexibility, will be used to augment excavation capacity, depending on the mining application.

Wheel loaders are highly mobile, can be rapidly deployed to specific mining conditions, and are highly flexible in their application. Diesel off-highway haul trucks will be used to transport the fragmented mineralized material to the crusher.

Track-mounted drill rigs are used to drill blast holes into the waste rock and mineralized material prior to blasting. Hole diameters will vary between 6 and 12 inches. Drill rigs may be either electrically powered, as is the case for the larger units, or diesel powered.

This equipment will be supported by a large fleet of ancillary equipment, including track and wheel dozers for surface preparation, graders for construction and road maintenance, water trucks for dust suppression, maintenance equipment, and light vehicles for personnel transport. Other equipment, such as lighting plants, will be used to improve operational safety and efficiency.

3.2.5. Mining Supplies and Materials

Fuel, lubricants, tires, and blasting agents (Table 3-5) will be the primary materials used in mining.

Table 3-5. Mining Supplies

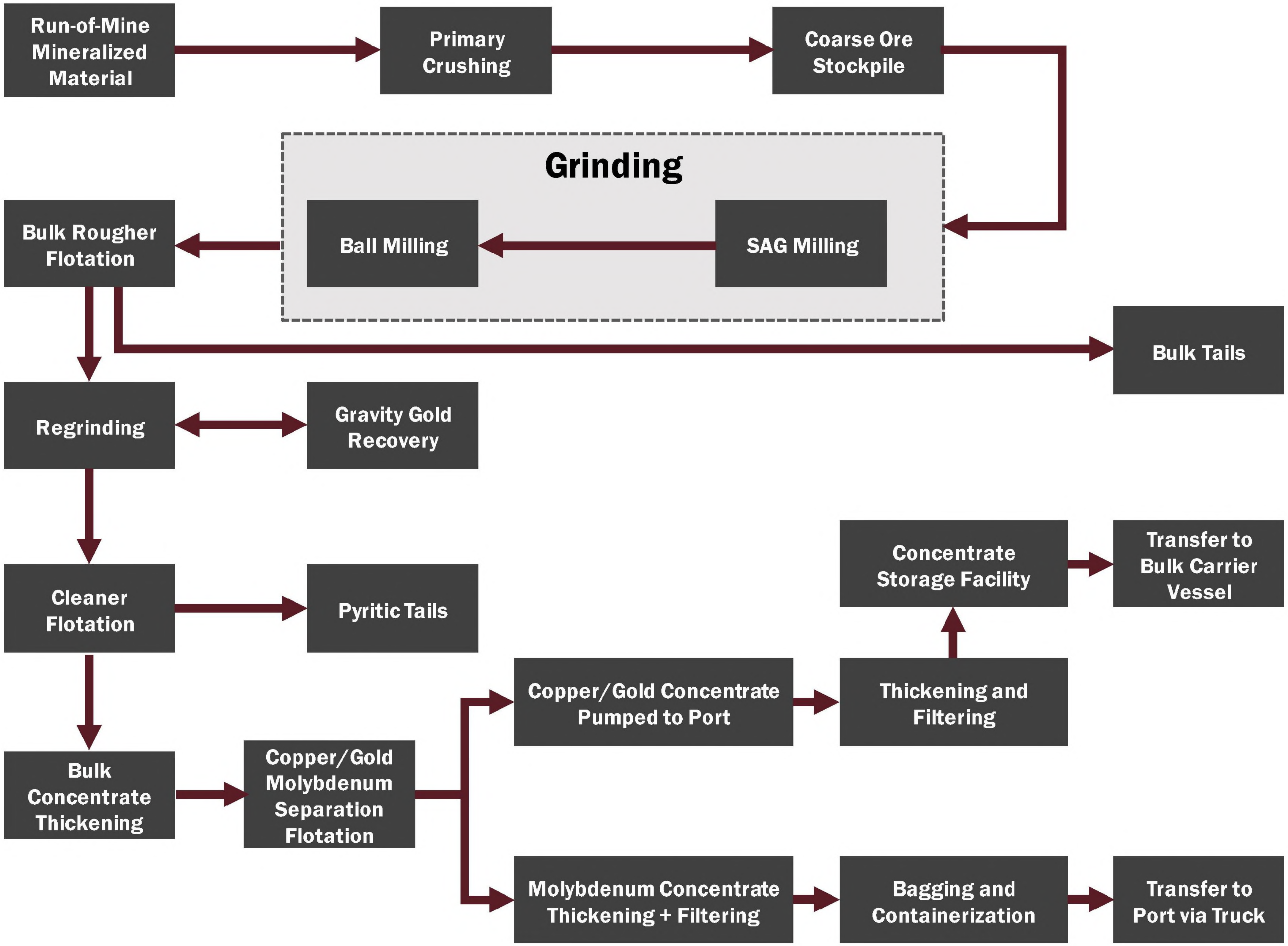
Consumable	Use	Shipping
Diesel fuel	Vehicles and blasting	6,350-gallon ISO tank-containers
Lubricants	Vehicles and equipment	Drums and totes in containers
Ammonium nitrate prill	Blasting	Bulk containers
Primers, detonators, and detonating cord	Blasting	Specialized packaging as required
Blasting emulsion ingredients	Blasting	Specialized packaging as required
Packaged explosives	Blasting	Specialized packaging as required
Haulage truck & other tires	Vehicles	Bulk containers/break bulk
Ground-engaging tools	Drilling and loading	Bulk containers

ISO = International Organization for Standardization

3.3. Mineral Processing

Mineral processing facilities will be located at the mine site. Blasted mineralized material from the open pit will be fed to a crushing plant to reduce the maximum particle size to approximately six inches. This crushed material will be conveyed to a coarse ore stockpile, which in turn feeds a grinding plant within the process plant. In the grinding plant, semi-autogenous grinding (SAG) mills and ball mills further reduce the plant feed to the consistency of very fine sand. The next step is froth flotation, in which the copper and molybdenum minerals are separated from the remaining material to produce copper-gold and molybdenum concentrates. The copper-gold concentrate slurry will then be pumped to the port site where it will be filtered, loaded onto the lightering barges, and then unloaded directly into the holds of Handysize bulk carriers for shipment. The molybdenum concentrate will be filtered at the mine site and placed in large sacks which are in turn placed in conventional shipping containers. The containers will be trucked to the port and shipped with the remaining empty shipping containers to refineries located outside Alaska, Gravity concentrators will be placed at strategic locations to recover free gold, which will be shipped off site for refining. Other economically valuable minerals (gold, silver and palladium in the copper-gold concentrate and rhenium in the molybdenum concentrate) will be present in the concentrates. Figure 3-1 shows the process flowsheet.

Over the life of the Project, approximately 1.3 billion tons of mineralized material will be fed to the process plant at a rate of 180,000 tons/day. On average, the process plant will produce approximately 613,000 tons of copper-gold concentrate per year, containing approximately 318 million pounds of copper, 362,000 ounces of gold and 1.8 million ounces of silver, and approximately 15,000 tons of molybdenum concentrate, containing about 14 million pounds of molybdenum.



THE pebble PARTNERSHIP

FIGURE 3-1

Process Flow Sheet

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Rev: 0	Author: HDR

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3.3.1. Crushing

3.3.1.1 Primary Crushing

Mineralized material from the open pit will be delivered by 400-ton haul trucks to primary gyratory crushers located adjacent to the rim of the open pit. The crushers will reduce the mineralized material to a maximum size of six inches. The crushed mineralized material from both crushers is delivered via a single, covered, overland conveyor to the coarse ore stockpile.

3.3.1.2 Coarse Ore Stockpile

The coarse ore stockpile is contained within a covered steel frame building to minimize fugitive dust emissions and control mineralized material exposure to precipitation. The stockpile provides surge capacity between the crushers and the process plant, improving the efficiency of the latter and enabling it to operate if the feed from the crushers is not available.

The stockpiled material will be reclaimed by apron feeders mounted below the pile that deliver it onto two conveyor belts feeding the SAG mills. Baghouse-type dust collectors will be provided at each transfer point to control fugitive dust emissions. Water will be added to the process at the SAG mill, thereby eliminating the need for additional baghouses. A sump will be located in each reclaim tunnel to collect any excess water; however, such drainage is likely to be minimal, as it is preferable to handle coarse material dry to prevent freezing during cold conditions. An escape tunnel also will be provided for worker safety, with ventilation as required.

3.3.2. Grinding

The primary grinding circuit will use two parallel, 40-foot-diameter SAG mills and associated ball mills to grind mineralized material to the finer consistency necessary to separate the valuable minerals. Steel balls are added to the SAG mill to aid in grinding the mineralized material. Coarse mineralized material, water, and lime are fed into the SAG mills and the mineralized material is retained within the SAG mills by grates until the particles reach a maximum size of one to two inches.

Discharge from each SAG mill will be screened to remove larger particles ranging from one to two inches ("pebbles"). Material passing through the screens will be sent to the ball mills while the large particles will be conveyed to the pebble-crushing facility where they will be crushed and re-introduced to the SAG mill.

The next grinding step is ball milling. Ball mills have a lower diameter-to-length ratio than SAG mills and use a higher percentage of smaller steel balls compared to SAG mills, allowing them to grind the feed to a finer size. Two ball mills will be matched with each SAG mill.

The slurry from the ball mills will be pumped into the hydro-cyclones, which separate the finer material from the larger material through centrifugal force. The slurry with the coarser material will be recycled back to the ball mills for additional grinding. The slurry containing the finer material will be pumped to the flotation cells. Grinding circuit slurry pH levels will be adjusted to 8.5 by

adding lime slurry to minimize corrosion on the mill liners and promote efficient mixing prior to flotation.

3.3.3. Concentrate Production

Copper-gold and molybdenum concentrates will be produced via flotation, which will separate the metal sulfides from pyrite and non-economic minerals. Two tailings streams will be produced: bulk tailings and pyritic tailings.

3.3.3.1 Bulk Rougher Flotation

The rougher flotation circuit is designed to separate the sulfide minerals, predominantly copper, molybdenum, and iron sulfides (pyrite) within the process plant feed from the non-sulfide minerals. Slurry from the ball mills is split between two banks of bulk rougher flotation cells. Reagents added to the slurry promote mineral separation by inducing mineral particles to attach to air bubbles created by blowing air through the flotation cells. Additional reagents are added to promote froth bubble stability. This froth, with the mineral particles attached, rises to the surface and is collected as a bulk rougher concentrate for the next phase of flotation.

Bulk rougher concentrate slurry is then routed to the regrind circuit. Material that does not float – the bulk flotation tailings from which most of the sulfide minerals have been removed – will be pumped to two tailings thickeners.

3.3.3.2 Regrind

The bulk rougher concentrate is reground to sufficiently liberate minerals and enable the separation of the copper-molybdenum sulfide minerals from iron and other sulfides, thus producing concentrates with commercially acceptable grades. A gravity gold recovery circuit is attached to the regrind circuit to recover free gold that might otherwise be lost.

3.3.3.3 Cleaning

Reground bulk rougher concentrates will be upgraded through a two-stage cleaning process. The concentrate from the cleaning process will report to copper-molybdenum separation, while the tailings will report to the pyritic tailings thickener for thickening prior to pumping to the pyritic TSF. The same reagents used in the rougher flotation circuit will be used in the cleaning circuit, with additional reagents used to aid in the suppression of gangue minerals. The cleaning stage is operated at an elevated pH—through lime addition—to suppress pyritic minerals, which would lower the grade of final concentrates.

3.3.3.4 Bulk Concentrate Thickener

Water will be removed from the bulk concentrate in a conventional thickener. This will remove as much of the bulk flotation reagents as possible before the slurry enters the copper-gold/molybdenum separation circuit, thus increasing separation process efficiency. Reagents will be recycled to the rougher process with the thickener overflow. The resulting slurry will contain 50 percent solids by weight and will go forward to copper-gold/molybdenum separation.

3.3.3.5 Copper-Gold/Molybdenum Separation Flotation

The final flotation process is designed to separate copper-gold and molybdenum concentrates by adding reagents. The concentrate from the separation stage is the molybdenum concentrate, while the tailings comprise the final copper-gold concentrate.

3.3.3.6 Concentrate Dewatering, Filtration, and Pumping

The upgraded copper-gold concentrate will be thickened to 55 percent solids by weight in a high-rate thickener. The thickener overflow will return to various circuits for use as process water. The thickener underflow will be fed to a pump to transfer it via the concentrate pipeline to the port. At the port, pressure filters will reduce the moisture to approximately eight percent. The filter product will be stored in a covered building at the port site.

The molybdenum concentrate will be thickened in a high-rate thickener to 55 percent solids by weight. The thickener underflow will be pumped to the molybdenum concentrate filter press, where the moisture content will be reduced to 12 percent. The filtered concentrate will be further dewatered by a dryer to five percent moisture before being bagged, containerized, and shipped offshore.

3.3.4. Processing Reagents and Materials

Table 3-6 provides a list of commonly used reagents for this type of process, along with their typical packaging for transportation. The final reagent list will be determined during detailed design.

Table 3-6. Processing Reagents and Materials

Reagent	Use	Shipping/Preparation
Calcium Oxide (quick lime)	pH modifier; depresses pyrite in the copper-molybdenum flotation process.	Calcium oxide pebbles (80 percent) shipped in specially adapted shipping containers. Pebbles will be crushed and mixed with water to form lime slurry at the lime plant.
Sodium Ethyl Xanthate	Copper collector; used in the rougher flotation circuit.	Pelletized reagent shipped in 1-ton bags. Mixed with process water to form 20 percent solution and stored in collector storage tank. Mix and storage tanks vented externally with fans.
Fuel Oil (Diesel)	Used in the flotation process.	Shipped in ISO tank-containers and stored in the main head tank in the copper-molybdenum concentrator area.
Sodium Hydrogen Sulfide (NaHS)	Copper depressant used in the copper-molybdenum separation processes.	Pelletized reagent shipped in 1-ton bags. Mixed with process water to form 20 percent solution and stored in the NaHS storage tank.

Reagent	Use	Shipping/Preparation
Carboxy Methyl Cellulose	Depressant; anionic polymer used to depress clay and related gangue material in the bulk cleaner flotation circuit.	Pelletized reagent shipped in 1-ton bags. Mixed with process water in the agitated dispersant tank to form 20 percent solution and stored in dispersant storage tank.
Methyl Isobutyl Carbinol	Frother; maintains air bubbles in the flotation circuits.	Shipped in 20-foot specialized ISO containers and stored in the frother storage tank.
Depressant (sodium silicate)	Clay or silica gangue mineral depressant used in the copper-molybdenum separation process.	Pelletized reagent shipped in 1-ton bags. Mixed with process water to form 20 percent solution and stored in the sodium silicate storage tank.
Anionic polyacrylamide	Thickener aid.	Pelletized reagent shipped in 1-ton bags. Vendor package preparation system composed of a bag breaking enclosure to contain dust, dry flocculent metering, and a wet jet system to combine treated water with the powdered flocculent in an agitated tank for maturation. Prepared in small batches and transferred to a flocculent storage tank.
Polyacrilic acid	Antiscalant for the lime production process.	Viscous pale amber liquid shipped in 35-cubic-foot specialized container tanks within protected rectangular framework.
Nitrogen	Nitrogen used in the molybdenum flotation circuit to depress copper sulfides.	Nitrogen will be provided by a vendor-supplied pressure swing adsorption nitrogen plant. This equipment separates nitrogen from air for use in the mineral-process plant.

3.3.5. Process Water Supply System

Process water will be drawn from the main WMP and the tailings thickener overflow streams. The primary process water source is the bulk tailings thickener overflow. Precipitation runoff will either be diverted by non-contact water diversion channels, or collected in sediment ponds as appropriate, and pumped to the main WMP. Some treated water will be diverted to the process for pump glands and other similar applications.

3.3.6. Tailings Production

Processing mineralized material to recover copper, gold, and molybdenum will produce two types of tailings: bulk flotation and pyritic. Bulk flotation tailings will be pumped to the bulk tailings thickener, where flocculant will be added as necessary to help the settling process. Tailings

thickener underflow, at approximately 55 percent solids, will be pumped to the bulk TSF. The pyritic tailings will be thickened, mixed with WTP sludge, and pumped to the pyritic TSF. The overflow streams from each thickener will be returned to the process. Supernatant water in the bulk and pyritic TSFs will be reclaimed to the mill site WMP. Some of this water will be pumped to the process water tank for re-use in the process plant. Any surplus water will be treated in the WTP and discharged.

3.4. Tailings Storage Facilities

Separate TSFs will be constructed for the bulk and pyritic tailings located primarily within the NFK watershed (Figure 1-4). Total TSF capacity will be sufficient to store the 20-year mine life tailings volume (1.3 billion tons). Approximately 88 percent of the tailings will be bulk tailings, and approximately 12 percent will be pyritic tailings.

The unlined bulk TSF has two embankments – main and south. The pyritic TSF will be lined and has three embankments – north, south, and east.

Starter embankments for both facilities will be constructed as part of the initial TSF construction. The main embankment of the bulk TSF will function as a permeable structure to maintain a depressed phreatic surface in the embankment and in the tailings mass in proximity to the embankment. A basin underdrain system will be constructed at various locations throughout the bulk TSF basin to provide preferred drainage paths for seepage flows. The pyritic TSF will be a fully lined facility with an underdrain system below the liner.

The pyritic TSF, which will also contain the PAG waste, will have a full water cover during operations, while the bulk tailings cell will have a small supernatant pond, located away from the embankments, to promote large tailings beach development upstream of the embankments.

The bulk TSF downstream embankment slopes will be maintained at approximately 2.6H:1V (horizontal:vertical), including buttresses established at the downstream toe of the main embankment. The final embankment crest elevation will be approximately 1,730 feet above sea level for bulk TSF. Embankment heights, as measured from lowest downstream slope elevation, will be 545 feet (main) and 300 feet (south).

The pyritic TSF downstream embankment slopes will be maintained at 2.6H:1V. The final crest elevation will be 1,620 feet above sea level. The north embankment height will be 335 feet, the south embankment height will be 215 feet, and the east embankment height will be 225 feet.

3.4.1. Siting Criteria

PLP conducted a multi-year, multi-disciplinary evaluation to select TSF locations that meet all engineering and environmental goals while allowing for cost-effective integration into the site waste and water management plans. During this evaluation, more than 35 tailings disposal options were tested against a range of siting criteria, including:

- **Minimize potential impact to environmental resources.** The selected sites are within valleys supporting mixed uplands and wetland shrub/herbaceous shrub. The

valleys include tributaries to the NFK that have experienced intermittent flows. Index counts indicate lower fish presence than at other locations. Potential impacts to waterfowl are likewise reduced by avoiding areas with high-value habitats for nesting, breeding, molting, or migration.

- **Provide adequate storage capacity.** The sites will accommodate tailings for the 20-year life of the Project.
- **Reasonable proximity.** The sites minimize the distance to the process plant, which reduces power consumption and the overall project footprint.
- **Facilitate closure.** Segregating the pyritic tailings and PAG waste allows for placement of both in the pit at the end of the mine life, thus eliminating this structure from the long-term closure plan.

3.4.2. Design Criteria

The TSFs will be designed to meet or exceed the standards of the updated 2017 *Guidelines for Cooperation with the Alaska Dam Safety Program* (ADSP) prepared by ADNR. The TSFs will be designed to the standards of a Class I hazard potential dam (the highest classification).

The final TSF designs will incorporate the following:

- Permanent, secure, and total confinement of bulk tailings solids within an engineered disposal facility.
- Secure, and total confinement of pyritic tailings and PAG waste rock within a fully lined, engineered facility, with these materials relocated to the pit at closure.
- Control, collection, and recovery of tailings water from within the tailings impoundments for recycling to the process plant operations as process water, or treatment prior to discharge to the environment.
- Providing seepage collection systems below the impoundment structures to prevent adverse downstream water quality impacts.
- The inclusion of sufficient freeboard within the bulk TSF that the entire volume of the Inflow Design Flood (IDF) will not flood the entire tailings beach, maintaining the beach between the maximum operating pond and the bulk TSF embankments.
- Limiting the volume of stored water within the bulk TSF and keeping the operating pond away from the dam face.
- Maintaining the pyritic tails and PAG waste in a sub-aqueous state to prevent oxidation.
- The consideration of long-term closure management at all stages of the TSF design process.
- The inclusion of monitoring instrumentation for all aspects of the facility during operations and after closure.

- The design includes flattened slopes to increase the static factor of safety.

3.4.3. Tailings Deposition

Each tailings stream will be delivered to its respective TSF using two pump stations, one located in the process plant and one booster station positioned approximately mid-way along the pipeline route. The bulk tailings will be discharged via spigots spaced at regular intervals along the interior perimeter of the bulk tailings cell to promote beach development, which will allow the supernatant pond to be maintained away from the main embankment.

PAG waste rock will be placed in a ring around the interior of the pyritic TSF. Pyritic tailings from the cleaner scavenger flotation circuit will be discharged into the pyritic TSF at sub-aqueous discharge points, with the level maintained just below the upper bench level for the PAG waste being stored. The sub-aqueous discharge is necessary to prevent oxidation and potential acid generation.

3.4.4. Construction

A "Certificate of Approval to Construct a Dam" is required from ADNR for the construction of impounding structures meeting the minimum height or impounding thresholds. The TSFs, seepage collection ponds, and WMPs will be jurisdictional dam structures regulated by ADSP. The certificate will include any special conditions or limitations on the construction.

The embankments will be constructed using suitable rockfill or earthfill materials, including quarried rock, NPAG and non-ML waste rock excavated from the open pit, if available, and stripped overburden.

3.4.4.1 Bulk TSF

Main Embankment

The main embankment will be constructed using the centerline construction method with local borrow materials. The centerline construction method provides a high level of embankment stability while reducing the embankment material requirements associated with the downstream method.

The embankment foundation will be prepared by removing overburden materials to competent bedrock prior to the placing structural fill materials. Construction begins with a cofferdam to capture upstream runoff during starter embankment construction. The starter embankment will be constructed to a height of approximately 265 feet and provide capacity to store tailings for the first 24 months of operation.

The material for the starter embankments will be sourced from a quarry located within the impoundment area. The bulk TSF embankments will be raised progressively during the mine life. After the quarry within the impoundment is inundated with tailings, material will be sourced from two quarries immediately west and east of the impoundment.

The earthfill/rockfill embankment will include engineered filter zones and a crushed or processed aggregate drain at the topographic low point. This drain will provide a preferable seepage path from the tailings mass to downstream of the embankment toe. Additional underdrains running parallel to the embankment will allow for drainage of seepage collected along the embankment.

South Embankment

The south embankment will be constructed using the downstream construction method to facilitate lining of the upstream face, which is constructed at a 3H:1V slope. The downstream slope will be at 2.6H:1V. Overburden materials will be removed to competent bedrock below the embankment. The earthfill/rockfill embankment will include engineered filter zones and a grout curtain to reduce seepage below the embankment.

3.4.4.2 Pyritic TSF

The embankments will be constructed using the downstream method with an overall downstream slope of 2.6H:1V. The embankments will be constructed using select borrow materials and include a liner bedding layer, overlain by a liner, on the upstream slope and over the entire internal basin. Basin underdrains will collect and convey any seepage to the downstream seepage collection ponds.

3.4.4.3 Main Water Collection Pond

The Main Water Management Pond is the primary water management structure at the mine site. It will be a fully lined facility and constructed using quarried rockfill materials founded on competent bedrock**.** The embankment is approximately 190 ft high with an overall downstream slope of approximately 2H:1V and an upstream slope of 3H:1V to accommodate the liner. It will be constructed to its final height during the initial construction period. In addition to the geomembrane liner the embankment will include a filter/transition zone. The basin and upstream embankment face will include a layer of materials above the liner to provide ice protection during freezing conditions.

3.4.4.4 TSF Embankment Lifts

TSF embankments will be constructed in stages throughout the life of the Project, with each stage providing the required capacity until the next stage is completed. A 'Certificate of Approval to Modify a Dam' is required from ADSP for each construction lift. Planned embankment raises will be evaluated each year and sized according to a review of the process plant throughput, actual tailings settled densities (TSF ponds are typically sounded to establish the size of the supernatant pond and the density of the deposited tailings in the TSF), and water storage requirements.

3.4.5. Freeboard Allowance

All stages of embankment design include a freeboard allowance above the maximum operating TSF pond level and tailings beach. The freeboard allowance includes containment of the IDF and wave run-up protection, as well as an allowance for post-seismic embankment settlement. The IDF for the facility has been selected as the Probable Maximum Flood (PMF).

The embankment freeboard requirements will be reviewed as part of each dam lift and dam safety review, and will be adjusted, as required to reflect actual mine water management conditions.

3.4.6. Surface Water

The hydrologic input to the TSF design consists of two primary factors –operating conditions based on the 76-year climate record and the IDF. The IDF for the TSF, pyritic TSF, and the main WMP is the PMF, which in turn is calculated using the 24-hour Probable Maximum Precipitation (PMP) event plus the snow water equivalent from a 1-in-100-year snowpack. Available storage, or freeboard, will always be maintained within the storage facilities to account for the IDF. Maximum operating conditions will not encroach on the freeboard allowance.

Pumps located at the bulk tailings cell supernatant pond will control the water level by transferring excess water to either the seepage control pond or the main WMP.

The pyritic TSF will be a fully lined, water retention facility. The primary means of controlling the water level within pyritic TSF will be by pumping from this cell to the main WMP or the mill.

The main WMP will be a fully lined, water retention facility used to store surplus water for milling, or for managing surplus water from other impoundment and seepage structures. The primary means of controlling the water level in the main WMP is by treating surplus water and discharging to the environment. The design of the main WMP will also incorporate an emergency spillway.

3.4.7. Seepage

The main embankment of the bulk TSF will be designed to promote seepage to the seepage collection pond, thereby minimizing the volume of water contained within the impoundment and enhancing consolidation of the tailings solids.

For the other embankments, seepage controls will include grout curtains, liners, and low-permeability zones. The low-permeability zones, in conjunction with the low-permeability tailings mass, will function as the primary seepage control barriers of the internal and east embankments.

The seepage management system will also include seepage control measures downstream of the TSF embankments. These include seepage recycle ponds with grout curtains and low-permeability core zones, and downstream monitoring wells. Embankment runoff and TSF seepage collecting in the downstream seepage collection ponds will ultimately be transferred to the main WMP to be used in mining operations or treated for discharge.

3.5. Mine Site Infrastructure

Due to the remote location and the absence of existing infrastructure, the Project will be required to provide basic infrastructure, as well as the support facilities typically associated with mining operations. These facilities require reasonable access from the Pebble Deposit, and they have been situated foremost for stability and safety. Figure 1-4 shows the mine site layout.

3.5.1. Power Generation and Distribution

There is no existing power infrastructure in the Project vicinity. All required generating capacity, distribution infrastructure, and backup power will be developed by the Project.

To meet the projected power requirement while providing sufficient peaking capacity and N+1 redundancy (one generating unit held in reserve for maintenance or emergency use) will require a plant with an installed nameplate capacity of 270 MW. The plant will use high-efficiency combustion turbine generators operating in a combined-cycle configuration. The units will be fired by natural gas provided to the site via pipeline. Design-appropriate controls will be used to manage airborne emissions and meet Alaska Department of Environmental Conservation (ADEC) air quality criteria and best management practices (BMPs). A closed-loop glycol system will capture some heat from the system for space heat with the unused waste heat rejected through a closed-loop, water cooled system that circulates water through the steam condenser to a mechanical draft cooling tower.

The various mine load centers would be serviced by a 69-kilovolt distribution system using a gas-insulated switchgear system located at the power plant.

Emergency backup power for the mine site will be provided by both standby and prime-rated diesel generators connected into electrical equipment at areas where power is required to ensure personnel safety, avoid the release of contaminants to the environment, and allow for the managed shutdown and/or ongoing operation of process-related equipment.

3.5.2. Heating

Waste heat from the power plant will be used to heat mine site buildings and supply process heating to the water treatment plant. Low-pressure steam, via heat exchangers, will heat a closed-loop glycol system that distributes heat to various buildings. Warm water from the steam condenser discharge will be routed to the water treatment plant to provide process heating.

3.5.3. Shops

The truck shop complex will house a light-vehicle maintenance garage, a heavy-duty shop that can accommodate 400-ton trucks, a truck wash building, a tire shop and a fabrication and welding shop. The layout is designed to maintain optimal traffic flow and minimize the overall complex footprint. An oil-water separation system will be designed for water collected from the wash facility and floor drains.

3.5.4. On-site Access Roads

There will be several access roads within the mine site area, including a road from the gatehouse to the mine site and secondary roads linking with the various facilities around the mine. Roads will be sized according to the operating requirements and the types of equipment using them. Traffic associated with in-pit activity will be segregated from access road traffic to avoid cross-contamination of vehicles with mud and dust from the pit.

3.5.5. Personnel Camp

The first camp to be constructed at the mine site will be a 250-person fabric-type camp to support early site construction activities and throughout the Preproduction Phase as required for seasonal peak overflows. The main construction camp will be built in a double-occupancy configuration to accommodate 1,700 workers. This facility will later be refurbished for 850 permanent single-occupancy rooms for the operations phase. The camp will include dormitories, kitchen and dining facilities, incinerator, recreation facilities, check-in and check-out areas, administrative offices and first aid facilities.

The mine will operate on a fly-in, fly-out basis, except for those personnel residing in the communities connected to the access road corridor. Non-resident personnel will be flown in and out of the Iliamna Airport and transported to the site by road. Workers will remain on site throughout their work period. Site rules will prohibit hunting, fishing, or gathering while on site to minimize impacts to local subsistence resources.

3.5.6. Potable Water Supply

A series of groundwater wells located north of the mine site will supply potable water to the mine site. Preliminary tests indicate that minimal water treatment will be required. Treatment will likely include multimedia filtration, chlorination with sodium hypochlorite, and pH adjustment with sodium hydroxide. The treatment plants will be designed to meet federal and state drinking water quality standards.

Potable water will be distributed through a pump and piping network to supply fresh water to holding tanks at the personnel camp and process plant. Holding tank capacity will be sufficient for a 24-hour supply. Diesel-fired backup pumps will also be installed to provide potable water during an electrical outage.

3.5.7. Communications

Communications to site will be via fiber optic cable with satellite backup for critical systems. The fiber optic cable will connect to existing fiber optic infrastructure in the region or a dedicated fiber optic cable laid in conjunction with the gas pipeline.

The process plant communication system will use a dedicated ethernet network to support mine process control system communications. A separate network will connect various main components of the fire-detection and alarming system. Closed-circuit television, access control, and voice over internet protocol telephone systems will be integrated with the local area network. Mine operations will use two-way radios, cell phones, and similar equipment for communications.

Diamond Point Port operations will be serviced by the fiber optic cable. Radio and/or cell service will be provided for communications at the port with the antenna located with the port facilities.

3.5.8. Laboratories

Two laboratories will operate at the mine site during the Production Phase.

Staff affiliated with the process plant will operate the metallurgical laboratory to support process plant operations. This work will include routine operations support tests to confirm the metallurgical response of near-term plant feed, and development analysis to evaluate alternate treatment strategies. The laboratory will use state-of-the-art equipment and have fully equipped facilities for sample receiving and storage, sample preparation, and flotation.

The assay laboratory will be equipped with the necessary analytical instruments to provide routine assays to support mine and process plant operations. Some environmental samples will also be tested in this laboratory, although many of these samples will likely be submitted to external, third party laboratories.

Each laboratory will be equipped with fume hoods (with exhaust treatment, if required) and drains connected to a central receiving tank. Chemical wastes will be disposed of in accordance with all applicable laws and regulations.

3.5.9. Fire and Emergency Response

The mine site and Diamond Point Port site will be equipped for fire and emergency response. Water for fire suppression will be stored within the freshwater supply tanks at the mine and port and distributed via an insulated pipeline system that meets all pertinent code requirements. A fire truck and ambulance will be located at the mine site. An ambulance will be located at the Diamond Point Port and a pump truck will be used to deliver fire suppression water. A senior member of the safety and health management team, with appropriate training and experience, will have designated responsibility for emergency response. Emergency response teams at the mine and Diamond Point Port sites will be staffed by volunteers and will be trained in fire suppression and mine rescue in accordance with regulations.

Both the mine and Diamond Point Port site will be staffed with an emergency medical technician to provide advanced medical care; appropriate facilities will be established at both locations. As necessary, this person may draw on the capabilities of the existing clinic in Iliamna. Arrangements will be made in advance for emergency evacuation via the airport in Iliamna. Designated locations for helicopter pads will be defined at the mine and Diamond Point Port sites.

Equipment will be installed at the mine site and the Diamond Point Port to deal with oil spills; crews will be appropriately trained for such response.

3.6. Material Management and Supply

General supplies and bulk reagents will typically be stored in, or adjacent to, the areas where they will be used. The location of the explosives storage and emulsion manufacturing plant is based on the need to minimize transfer distances and to provide a safety buffer between the explosives plant and other facilities. Descriptions of mining and process related supplies are provided in Table 3-5 and Table 3-6. Average annual quantities of fuel, mining, milling, and miscellaneous consumables are listed in Table 3-7.

Table 3-7. Supply Quantities

Supply	Average Annual Quantity
Fuel	16 million gallons
Ammonium Nitrate	17,500 tons
Grinding Media, Process and Water Treatment Reagents, and Miscellaneous Supplies	295,000 tons

3.6.1. Diesel Fuel

Diesel fuel to support the mining operation and logistics systems will be imported to the Diamond Point Port using marine barges. The expected maximum parcel size for delivery is four million gallons, which will allow for extended periods between shipments in winter months. The Diamond Point Port will accommodate sufficient bulk fuel storage to provide one month of buffer and allow for the offloading of bulk fuel carriers.

Diesel fuel will be transferred from the Diamond Point Port to the mine site using ISO tank-container units, which have a capacity of 6,350 gallons. These units will be loaded at the port and transported by truck to the mine site. Additional containers will be stored at the mine site to provide for a fuel reserve in the event of a supply disruption.

The main mine site fuel storage area will contain fuel tanks in a dual-lined and bermed area designed to meet regulatory requirements. Sump and truck pump-out facilities will be installed to handle any spills. There will also be pump systems for delivering fuel to the rest of the mine site. Dispensing lines will have automatic shutoff devices, and spill response supplies will be stored and maintained on site wherever fuel will be dispensed.

Fuel will be dispensed to a pump house located in a fuel storage area for fueling light vehicles. It will also be dispensed to the fuel tanks in the truck shop complex, which are used for fueling mining equipment. These tanks will also be in a lined and bermed secondary containment area.

3.6.2. Lubricants

Lubricants will be packaged in drums and/or totes and stored on site within a secondary containment area.

3.6.3. Explosives

The materials used to manufacture blasting agents include ammonium nitrate prill, fuel oil, emulsifying agents, and sensitizing agents (gaseous). The containers used to transport the prill will be offloaded, using a container tilter, to a bucket elevator, which will unload the prill to three silos, each sized for 150,000 pounds. As a safety precaution, ammonium nitrate prill will be stored and prepared for use at a location approximately 0.75 mile southeast of the final pit rim. Electrical delay detonators and primers will be stored in the same general area, but in a separate magazine located apart from each other and separate from the prill. All facilities will be constructed and